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Evaluation of Food Service Manager Certification Program

Bureau of Consumer Health Services,
Houston Department of Health and
Human Services (HDHHS)

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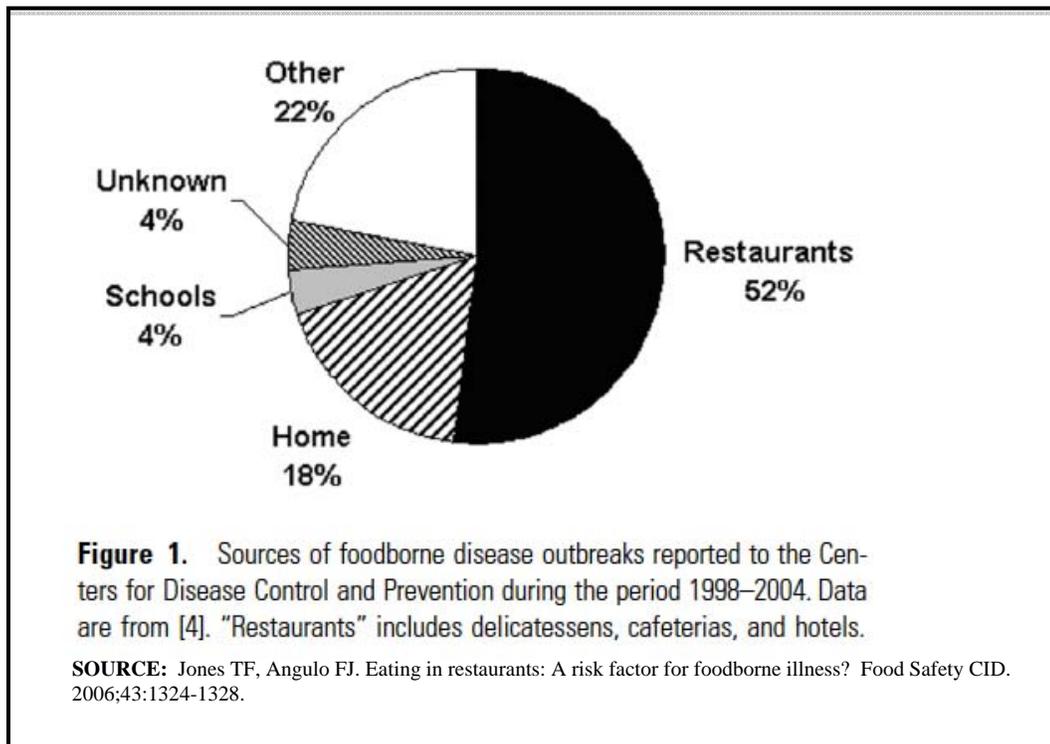


Background

Foodborne Illness

Foodborne illness is a public health concern in the United States.¹ Most of these illnesses, which are preventable, are caused by a variety of bacteria, viruses, parasites, toxins, metals, and prions. The symptoms can range from mild abdominal disturbances to life-threatening neurological, renal and hepatic syndromes.² The most common foodborne diseases are caused by Salmonella, Campylobacter and E. Coli O157:H7 bacteria and norovirus.³

The Centers for Disease Control actively collects data on foodborne disease outbreaks from all states and territories through a surveillance system.⁴ Data reported from 1998-2004 show evidence that 52% of foodborne disease outbreaks were associated with public food establishments (Figure 1).⁵



In 2006 (the most recent year for which data have been analyzed), a total of 1,270 foodborne disease outbreaks were reported. These outbreaks resulted in 27,634 cases and 11 deaths. Among the outbreaks with a confirmed etiology, norovirus was the most common cause,

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accounting for 54% of outbreaks and 11,879 cases, followed by Salmonella, which accounted for 18% of outbreaks and 3,252 cases. Among the 11 reported deaths, six were attributed to E. Coli O157:H7. ⁴ A limitation in the surveillance of foodborne illness is underreporting because many persons that are ill do not seek medical attention, and of those that do, many are not diagnostically tested.^{2,3}

Prevention of food establishment related disease outbreaks are an important role of public health departments.⁶ Starting in 1993, the U.S. Food and Drug Administration periodically issue the “Food Code” with the purpose “to safeguard public health and ensure that food is unadulterated and honestly presented when offered to the consumer.”⁷ The “Food Code” serves as a guide for health departments to develop or update their own food safety rules and to be consistent with national food regulatory policy.^{6,7}

Healthy People 2010 identified Food Safety as an objective for improving health with the goal to reduce foodborne illness.⁸ Sub-objective 10-6 is to “improve food employee behaviors and food preparation practices that directly relate to foodborne illnesses in retail food establishments.” The baseline and targets for this objective are pictured in table 1.⁹

TABLE 1. OBJECTIVE 10-6. Improve food employee behaviors and food preparation practices that directly relate to foodborne illnesses in retail food establishments.

Target and baseline:
Objective**Increase in Safe Retail Food Preparation Practices****1998****Baseline****2010****Target**

	<u>Percent</u>	<u>Percent</u>
<u>10-6a.</u> Hospital	<u>80</u>	<u>85</u>
<u>10-6b.</u> Nursing home	<u>82</u>	<u>87</u>
<u>10-6c.</u> Elementary school	<u>80</u>	<u>85</u>
<u>10-6d.</u> Fast food restaurant	<u>74</u>	<u>81</u>
<u>10-6e.</u> Full-service restaurant	<u>60</u>	<u>70</u>
<u>10-6f.</u> Deli department	<u>73</u>	<u>80</u>
<u>10-6g.</u> Meat/poultry department	<u>81</u>	<u>86</u>
<u>10-6h.</u> Produce department	<u>76</u>	<u>82</u>
<u>10-6i.</u> Seafood department	<u>83</u>	<u>87</u>

Target setting method: 25 percent improvement of observable out-of-compliance risk factors.
Data source: Retail Food Database of Foodborne Illness Risk Factors, FDA, CFSAN.

SOURCE: <http://www.healthypeople.gov/Data/midcourse/html/focusareas/FA10Objectives.htm>

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The CDC identifies five related risk factors contributing to foodborne illness by food employees as: improper holding temperatures, inadequate cooking, contaminated equipment, food from an unsafe source, and poor personal hygiene.⁸ Progress to achieving these goals requires education, training and resources for understanding and implementation of safe practices by food service workers.⁹ In a study published in 2009 in the Journal of the American Dietetic Association, researchers conducted a 2-year longitudinal study to evaluate the effectiveness of a food safety training course (ServSafe) and an additional intervention based on the Theory of Planned Behavior (TPB) to target employees' perceived barriers and attitudes towards food safety behaviors.¹⁰ The results suggest that food safety training improves knowledge, but training alone does not improve behavior. The addition of the TPB intervention to target perceived barriers and encourage perceived control improved overall compliance with food safety behaviors.¹⁰ The authors of this study suggest that food service managers and trainers should use behavioral science interventions, such as the Theory of Planned Behavior, in addition to traditional training courses, to facilitate food workers translating knowledge of food safety into practice.^{10,11}

History of Food Service Manager's Certification in Houston

On August 21, 1985, the Code of Ordinances of Houston, Texas created the laws which now govern the Houston Department of Health and Human Services (HDHHS). The HDHHS operates the Bureau of Consumer Health Services under which the Food Service Manager's Certification program is managed. The Food Service Manager's Certification program was created under Section 20-52 on September 12, 2007. Along with this program, Section 20-53a requires a certified food service manager to be on duty at all times. The goal of the Food Service Manager's Certification program is to train personnel in the safe handling of food in order to reduce food-borne illness in Houston. Patrick Key is the current Chief over the Bureau of Consumer Health Services' Food Inspection Program¹².

Specific food inspection in Houston

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The HDHHS has a lot of ground to cover with over 12,960 food establishments to monitor in Houston. The bureau's sanitarians conduct over 28,940 inspections of food establishments every year. The food service industry is known for its high turnover rates and untrained staff, which makes it difficult to ensure that all restaurant personnel possess the necessary skills for safe handling and preparation. Therefore, the HDHHS requires that a certified food service manager must be present when a food establishment is in operation. Through the food service manager certification program, the HDHHS hopes to ensure compliance with the Houston Food Ordinance.

There are five different classifications of inspections that sanitarians conduct. Routine inspections are conducted once a year on every food establishment. Types of data and observations collected in a routine inspection include establishment characteristics, food preparation and handling procedures, environmental conditions, sanitation practices, and certification of the restaurant managers on duty. As the name implies, pre-opening inspections take place before the establishment is open to the public. Re-inspections are completed after a set time frame to correct prior violations. Complaints submitted by restaurant patrons (and others who witness violations) receive a full investigation. Lastly, inspections are also performed when a food establishment has a change of ownership.

Based on a risk profile, food establishments are classified into low, medium and high risk, which indicate the likelihood that an adverse health affect will occur within a population as a result of food hazards.¹³ The risk profile evaluates the establishment based on the type of food, serving and preparation methods, quantity of meals and population served. The highest level of risk assigned is a level 3. Typically these establishments serve large numbers of people, potentially hazardous foods, and/or highly susceptible populations. Inspections on these establishments are conducted first.

During an inspection, violations are divided into critical and non-critical with each violation having a numerical value assigned. Critical violations are issued on practices that will likely result in food contamination, illness or environmental hazards. Examples of critical violations include no running water, sewage back up and food temperature problems. Non-critical violations are ones that may not have an immediate influence on food contamination

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but are not best practice and may lead to problems with the establishment in the future. Violations are entered into a computer database and assigned a predetermined weight that increases with the severity of the violation. Based on the tallied points, a score of 1-5 is generated indicating whether the establishment has passed or failed the inspection. It is this final score that determines when the establishment will receive their next inspection or depending on the severity of those violations, the food establishment could be forced to close until corrections have been made.¹³

School of Public Health's Role

The Houston Department of Health and Human Services has joined with the University of Texas Health Science Center's School of Public Health to conduct an evaluation of the Food Service Manager's Certification Program. Students seeking a masters or doctorate degree in public health are given the opportunity to use the skills they have learned from their health program planning, implementation, and evaluation class to evaluate this program. Specifically, the students focused on whether having a Certified Food Manager reduces the number of critical violations found during an inspection of a high risk food service establishment, and whether the overall inspection score is lower if a Certified Food Manager is present. Using the data provided by the HDHHS, observing a routine inspection, and attending a Food Manager's Certification Course, the students hope to be able to evaluate the effectiveness of the Houston Food Ordinance Section 20-53a Food Service Manager Certification Program and offer some helpful suggestions for improvement.

Stakeholders

The effectiveness of the Food Service Manager Certification program is important to many different people. Food Certification Course/Program Developers and staff are specifically concerned because they need to know that the information they are teaching is being understood. The evaluation will give Food Certification Course Program developers and staff the reassurance that their education is making a difference in the Houston community.

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Sanitarians also rely on this course when conducting inspections. The Food service manager at a food establishment is supposed to accompany the sanitarian during inspections so the sanitarian can show the food service manager the violations that need to be corrected. If an uncertified person is accompanying the sanitarian they may not understand the violation or how to correct it and this can lead to incorrect implementation of the Houston Food Ordinance. The sanitarian also has to spend more time during the inspection educating the uncertified manager which can lead to fewer inspections conducted.

Food establishment owners also rely on this program not only to teach them, but to ensure that their certified food service managers know how to comply with and enforce the Houston Food Ordinance when they are not present. Furthermore, a food establishment that is in violation of the Houston Food Ordinance can be forced to cease operations until violations are corrected. This loss in time and possible bad publicity is harmful to the success of a food establishment.

Lastly, but not least of all, the patrons of food establishments want to be sure that they are not going to be exposed to food borne illness while dining out. Patrons who frequent these food establishments rely on certified food service managers to ensure the safe handling of their food prior to consumption. People in the community are concerned about the safe handling of food at food establishments because the DHHS receives thousands of complaints every year from apprehensive patrons.

Objectives

The Food Service Manager Certification program has a few short term and long term objectives to help promote safe food handling. One short term goal of the Food Service Manager program is to increase knowledge of food safety practices based on current ordinances and for personnel to obtain certification. The long term goals include increasing the number of Certified Food Service Managers who implement changes to promote food safety programs in their establishments, increasing the number of Certified Food Service Managers who conduct on-site training to employees, and increasing the implementation and use of food safety practices. Overall, the end goal of the Food Service Certification Program is to reduce

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the incidence of food-borne illnesses. By evaluating the data provided we hope to determine whether having a Certified Food Manager reduces the number of critical violations found during inspections of high risk foodservice establishments and assess whether or not the program is effective in reducing overall violations.

Logic Model Description

A logic model provides a visual representation of a program, providing viewers a way in which to understand how the interplay between the resources available, the activities undertaken for the program, and the outputs or results of the activities affect outcomes¹⁴. Program outcomes may be short-term, intermediate and long-term, reflecting that the overall impact of the program, in this case limiting food-borne illnesses, requires incremental outcomes be achieved.

The goal of the project is to determine whether having a Certified Food Manager reduces the number of critical violations found during an inspection of a high risk foodservice establishment, and whether the overall inspection score is lower if a Certified Food Manager is present. The Houston Department of Health and Human Services Food Manager's Certification program works in parallel with the inspection of foodservice facilities. Certified Food Managers are provided training about the key concepts and specific requirements to operate foodservice establishments in a manner that complies with the Houston Food Ordinance. Once trained, Certified Managers are expected to implement their knowledge to ensure compliance, and therefore safe food handling practices. To ensure Certified Managers are doing this, foodservice establishments are inspected to validate compliance.

Several resources affect these parallel programs. The Houston Food Ordinance No. 09-762, Sections 52 and 53, the Food Manager's Certification course developers and staff that teach it, the Department of Health and Human Services budget, the sanitarians who conduct the inspections to verify compliance and the database into which inspection results and certification status of managers are maintained. Providing the course is required by Section 20-52 of the Ordinance. The materials for teaching the Food Service Manager's course are developed based on the Houston Food Ordinance. The main component of this is the Food

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Service Manager's Certification Manual, which is updated periodically to reflect changes in the Ordinance and in food safety guidelines. Everything that the Department of Health and Human Services wants a foodservice establishment to know and comply with is in this manual; it is therefore the basis for the training program curriculum. The resources that most affect the inspection program are the Health Department's budget, the sanitarians who conduct the inspections (the number of which is directly affected by the budget), and the database with which they input and track inspection results. Inspections reveal whether facilities are complying with the Ordinance; a key question as part of the inspection is whether or not there is a Certified Food Manager present as required by Section 20-53 of the Ordinance.

As a result of the Food Manager's course, one would expect that foodservice managers will improve their knowledge about food safety practices and requirements for safe foodservice operations provided by the Ordinance (short-term outcome). Desired intermediate outcomes are that a certified foodservice manager will use this knowledge to implement programs within her facility to comply with the Ordinance, as well as provide training to the staff regarding safe food handling. By doing both of these things, there is a reduced chance of food-borne illness to customers, and, in the long-term, facilities pass inspections with fewer violations.

Enforcement of these activities comes from the inspection program. Facilities who have violations are re-inspected based on the severity of the violations. When facilities have a Certified Food Manager on staff during all hours of operation, violations should be reduced if the desired outcomes of the certification program are achieved. In the end, these programs, along with all of the other efforts in place by the Health Department, help reduce the incidence of food-borne illness in Houston.

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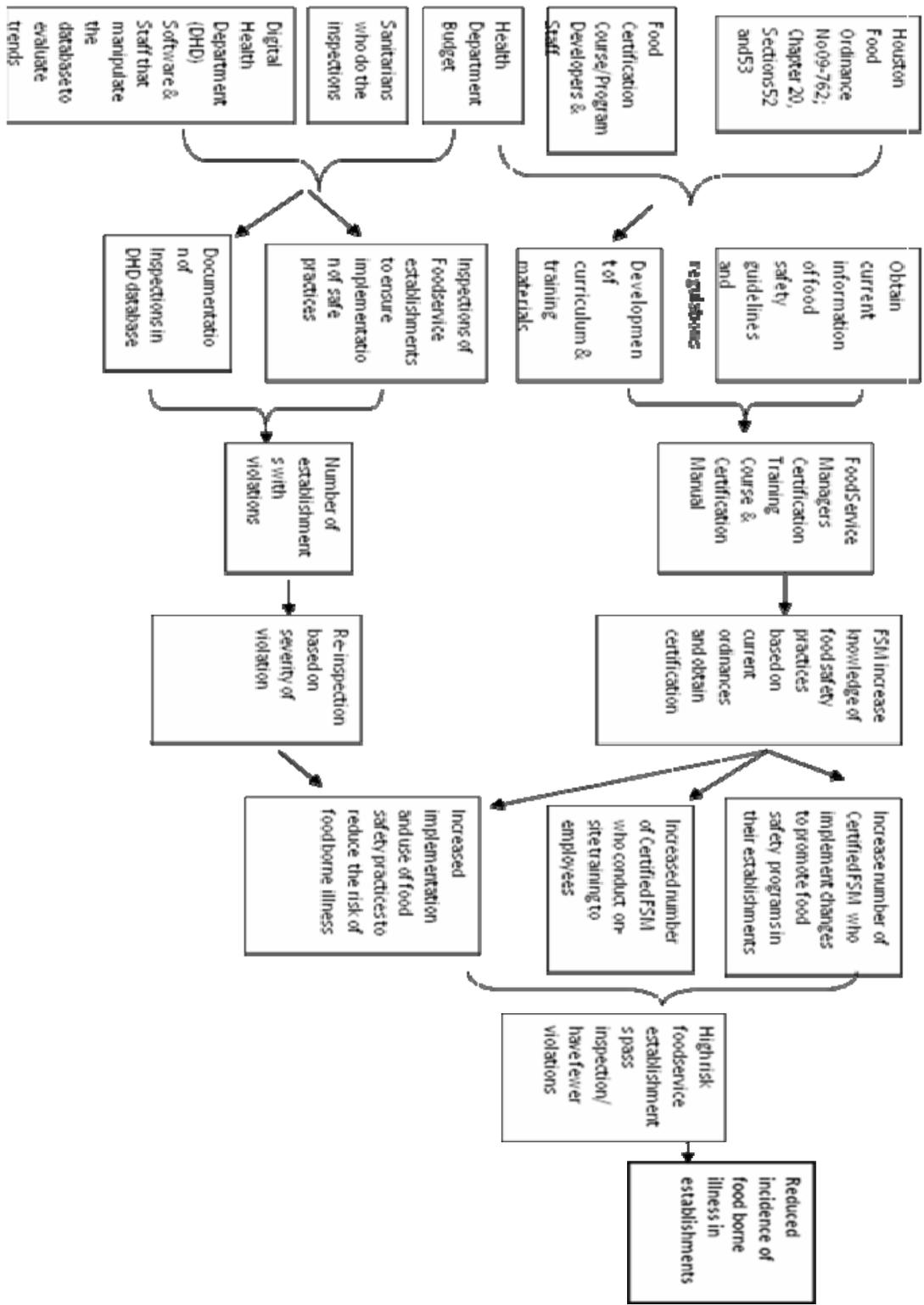


Figure 1: Logic Model

Methods

Observation of inspection/Foodservice Manager’s Certification Course

Two UTSPH students accompanied a certified sanitarian from the City of Houston on an unannounced, routine inspection of a high-risk establishment. One UTSPH student attended a Foodservice Manager’s Certification Course at the City of Houston Health Department.

Data Collection and Analysis

A Microsoft Excel spreadsheet of every violation received in 2009 by risk 3 establishments that were issued a citation for violating section 20-53(a) of the Houston Food Ordinance at any point during 2009 was provided by the Houston Department of Health and Human Services. This list included 4408 itemized violations for both inspections in which there was a violation of 20-53(a) and inspections in which there was no violation of 20-53(a). There were multiple violations over more than one inspection for most establishments on this list. For each violation, the account number, facility name, address, inspector name, inspection ID, date of inspection, violation number, and weight of the violation were provided. Additionally, the weights for all violations from a given inspection were tallied and a subtotal of points was provided. This subtotal was then converted to an overall inspection score. The point subtotals were grouped into scores as per the table below. This is the same scale for scoring inspections used by the Health Department for all inspections.

Points (total of all violation weights)	Score
0-4	1
5-8	2
9-16	3
17-24	4
25+	5

Table 2: Scale used to convert violation weight subtotals into inspection score.

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From this spreadsheet, 679 inspections in which there was a violation of 20-53(a) were identified. For only these inspections in which there was a violation of 20-53(a), three points were removed from the point subtotal to reflect an adjustment for the three points associated with the 20-53(a) violation. After removal of these three points, the score for each of these violations was calculated again. This process was done to adjust for the fact that the scores of these inspections may have been inflated by the actual 20-53(a) violation. Removal of the 20-53(a) violation from the inspection score allowed for more valid comparison to inspections in which there was no 20-53(a) violation. A new spreadsheet was created that contained only those inspections in which a violation of 20-53(a) occurred and their adjusted scores. The number of inspections whose scores changed after adjustment for the 20-53(a) violation was noted.

The original spreadsheet provided by the Health Department was also used to identify 1474 inspections that did not have violations of 20-53(a) but occurred in establishments that were in violation of 20-53(a) at some other point during the year. For these inspections, the violation weight subtotal was converted into an inspection score as per the scale above. There was no adjustment in scores performed for these inspections, since there was no 20-53(a) violation. The scores from these inspections were compared to the adjusted scores from the inspections that had a 20-53(a) violation using a paired, two-tailed t-test. All statistical analyses were performed in SPSS (SPSS for Windows, Rel. 11.0.1. 2001. Chicago: SPSS Inc.).

A list of all inspections occurring in risk 3 establishments during 2009 was obtained from the Digital Health Department Website¹⁵. This website was cross-checked with the list of inspections in which there was a 20-53(a) violation using the establishment account number and inspection date as identifiers. All those inspections that had a 20-53(a) violation were removed from the Digital Health Department data. This yielded a list of 14,662 inspections occurring in risk 3 establishments during 2009 in which there was no 20-53(a) violation. This differs from the list of inspections without 20-53(a) violations mentioned earlier in that this list includes all establishments, whereas the list described earlier only includes inspections for those establishments that had a violation of 20-53(a) at some other point in the year. The inspection scores of all inspections without a 20-53(a) violation were compared to the

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inspection scores of those inspections that had a 20-53(a) violation using an unpaired, two-tailed t-test. In this case, an unpaired t-test was appropriate because the group of inspections in which there was a 20-53(a) violation was independent from the group of inspections that did not have this violation.

Statistical Methods

A total of 14462 establishments were found to have never been listed to have committed violation 20-53a. 679 establishments were known to have had reported violation 20-53a at least once. The statistical analysis for this project was done using SPSS version 17 statistical software. Independent t-test was used for both the evaluations since we were comparing the means of two metric variables.

Results

Qualitative Results

Food Establishment Inspection Observations

The following results are based on the qualitative observation of the two UTSPH students that accompanied the certified sanitarian on a routine inspection. Before entering the food establishment, the sanitarian observes the exterior of the premises to determine if the proper signage is posted such as clearly visible non-smoking signs. Upon entering the establishment, the sanitarian introduces herself to the receiving employee and asks for the manager on duty. The manager is first required to show food establishment operating permits and valid food service manager certification. The manager at this specific restaurant did not have the certification card in his possession, which required the sanitarian to confirm the manager's certification in the system.

The inspection began at the back with observations made at the dumpster to make sure that the area was kept relatively clean, functional drain plugs were in-place, and lids were being used. The doors leading to the outside of the establishment were inspected to make sure that they were appropriately sealed to prevent rodents, pests, insects and debris from entering. A general observation of the restaurant then followed to ensure sufficient lighting, ventilation,

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cleanliness of ceiling and walls and non-hazardous flooring throughout. In this establishment, inadequate lighting was found above the grill, however, the manager corrected this violation immediately.

Dry area storage, in the back of the house, was inspected to ensure that items were stored above the ground, free from rodents, insects, pests and debris, that chemicals were labeled and stored away from the food supply and that the area was not being used for daily trash collection. In the walk-in refrigerator, the sanitarian made sure food temperatures were within regulated limits, that raw meats were not stored above fresh foods, food trays and containers were covered and appropriately labeled with time and date and that items were stored above ground level. The ice machine was checked for cleanliness and proper storage of handling instruments. For one of the ice machines in this establishment, handling equipment placement was not best practice. The food preparation and dishwashing area was inspected for availability of hot running water, adequate chemical levels of cleaning water solutions, and cleanliness of preparation surface areas. At the grill and food service areas, the hand washing sink was examined for functionality and temperatures of raw and cooked foods were measured. Food handling techniques were observed to ensure that employees were using clean utensils, dressed appropriately and wearing gloves while serving and preparing food. Outside the service area, guest bathrooms were checked for running water, functional sewage systems, availability of hand washing products, proper signage prompting employees to wash hands before returning to work and at least one trashcan with a lid. The men's bathroom at this particular establishment lacked a covered trashcan. This concluded the inspection, which was followed by the sanitarian verbally explaining to the manager the establishment's violations and the rationale. Then she proceeded to enter all data collected and observations made into the computer database that generates the inspection score. Based on the inspection conducted, the establishment assessed made a score of a 1, which indicates that few non-critical violations and no critical violations were observed.

Foodservice Manager's Certification Course Observations

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The Foodservice Manager’s Certification course is a comprehensive two-day course that provides those who wish to become certified an opportunity to learn the information necessary in accordance with the Houston Food Ordinance. The Food Service Manager’s Certification Manual is provided to all class attendees, and is covered from front to back.

The course is taught by a sanitarian who is very knowledgeable and skilled at relaying the information in a manner that is easily understood. Tactics such as repeating key concepts several times, asking the class to write a note by specific points in the manual, and verbal quizzes at the end of key sections all aid in the attendee’s learning of the material. Scenarios from experiences with inspections are provided to bring relevance to concepts being taught, and help reinforce the importance of the information and purpose of the course. Attendees were encouraged to ask questions to ensure they understood. At the beginning of day two, a verbal quiz was given to review the material covered on day one to reinforce this material. Prior to the lunch break, a comprehensive verbal quiz was again given to review many of the key concepts taught over the two-day course.

The test is an accurate reflection of the material covered and touches on key concepts and knowledge one would expect a certified manager to possess.

Quantitative Results

Null hypothesis (H₀): There is no difference between the mean scores of the establishments with and without violation 20-53(a).

Independent sample T-Test:

Table 3: Group Statistics

	Groups	N	Mean Score	Std. Deviation	Std. Error Mean
a	1.00	679	<u>2.4109</u>	1.28662	.04938
	2.00	14462	<u>1.5333</u>	.89561	.00745

1 : Group with violation; 2: Group without violation

Table 4: Independent Samples Test

	Levene's Test for Equality of Variances	t-test for Equality of Means
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	F	Sig.	t	df	Sig. (2-tailed) p-value	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
a Equal variances assumed	311.584	.000	24.380	15139	.000	.87757	.03600	.80701	.94813
Equal variances not assumed			17.574	709.182	.000	.87757	.04993	.77953	.97561

Interpretation: As seen above the p value is less than 0.05, hence we can reject the null hypothesis and say that there is a significant difference between the mean of the scores of the two independent groups with and without violation 20-53(a).

Null hypothesis (H₀): There is no difference between the mean scores of the inspections with and without violation 20-53(a) for the same establishments.

Paired T-Test:

Table 5: Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
Pair 1 a	<u>2.4088</u>	680	1.28681	.04935
c	<u>1.8779</u>	680	1.08196	.04149

a: inspections with violation; b: inspections without violations (both variables a and b represent the same group of establishments)

Table 6: Paired Samples Correlations

	N	Correlation	Sig.
Pair 1 a & c	680	-.055	.151

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Table 7: Paired Samples Test

	Paired Differences				t	df	Sig. (2-tailed)	
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower				Upper
Pair 1 a - c	.53088	1.72624	.06620	.40090	.66086	8.020	679	.000

Interpretation: since the p value is less than 0.05, hence we can reject the null hypothesis and state that a significant difference exists between the mean scores of inspections with and without violation 20-53(a), for the same group of establishments.

Mean scores of groups with or without violation (20-52a)

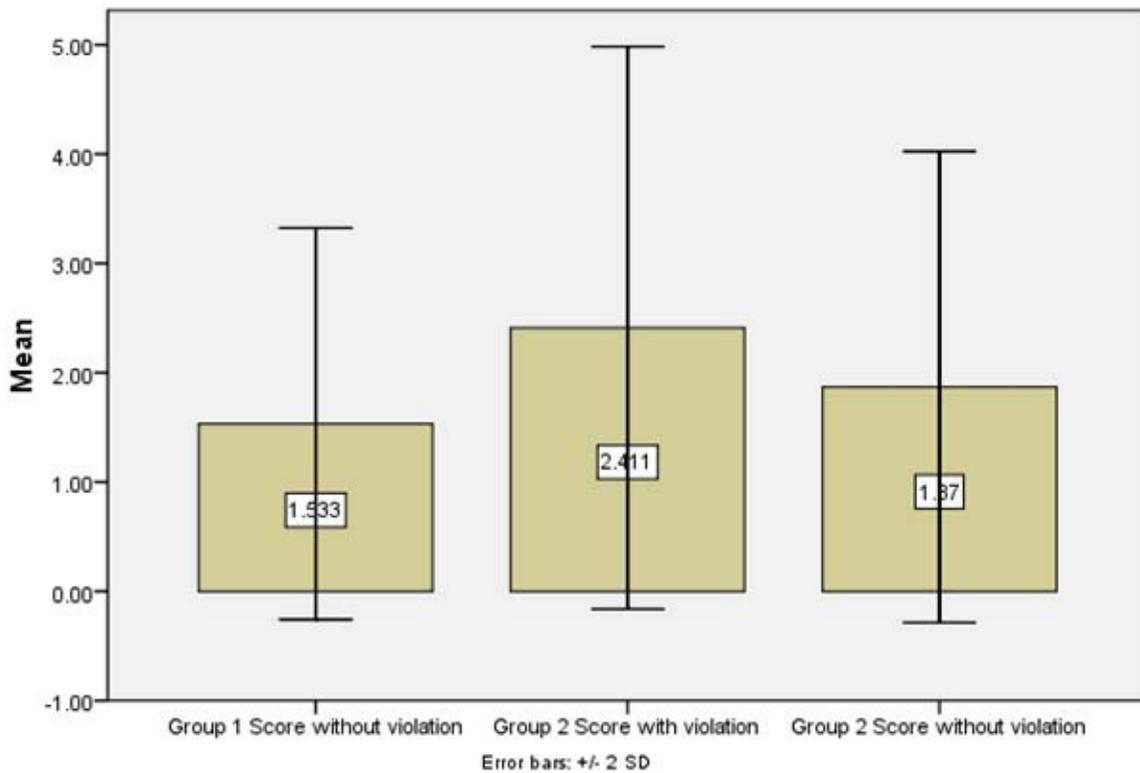


Figure 2: Bar graph

Discussion and Recommendations

A major aim in this study was to assess the effectiveness of the HDHHS Food Manager Certification program. Review of the data from the *Digital Health Department* shows that requiring a certified food service manager to be on duty at food establishments at all times (Section 20-53) positively impacts scores on inspection. Consequently, this beneficial effect can be linked to the certification program, but not to the specific course offered through the certification program. There are numerous avenues for an individual to be food service manager certified. As outlined previously, they may enroll in the 2-day course and pass the certification exam, they can recertify via the 1-day course and pass the exam, they can opt to take only the exam, or they can gain certification through reciprocity. Our analysis compared only inspections with 20-53a violations with inspections without 20-53a violations. In the 20-53a violations cases cohort, all 4 of the aforementioned methods were likely represented, which precludes us from drawing inferences pertaining specifically to the food service manager course. An additional objective of the evaluation was to see if having a food service manager on duty decreased critical violations. We were unable to distinguish critical and non-critical violations in our comparison, but overall violations were found to be reduced for those with a certified food manager on duty. Additional studies may be needed to stratify critical and non-critical violations in order to see if the effect of a food manager is more significant for one over the other.

It is important to ensure that the methods for certification are standardized. At this time, it is not possible for us to say whether compliance with the food ordinance is better for any single category. The main method by which to gauge if these approaches achieve the

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standard mandated by the food ordinance is to make all participants sit for the exam. Those who obtain certification by reciprocity are currently exempt from the exam, so we do not have an objective measure prior to certification to ensure they meet expectations of food service knowledge.

Observation of the food service manager course was also informative. Some class attendees were very knowledgeable, and clearly had been involved in foodservice management for many years. Others seemed to have little background in the basic food safety concepts taught. While this may be logistically difficult, it may be beneficial to pre-test individuals when they request to sign up for a class so that prospective attendees can be triaged to a more intensive two-day course if their baseline knowledge is limited. This would allow the instructor to tailor the class based on the attendees' baseline knowledge, perhaps expanding the time spent and the depth with which key concepts are covered. Perhaps this will increase knowledge and understanding and improve test scores.

This project was unable to assess whether test score has an effect on the "quality" of the certified manager. One would expect that those who score higher on the test would be better equipped to implement the concepts taught in the class. It may be worth assessing this to see if the degree to which the knowledge is implemented is affected by the level of knowledge achieved during the course.

Along these same lines, it might be helpful to ask attendees on the first day to write down three things they think they will learn or want to learn from the class. At the end of the two-days, prior to the test, ask them to write down three things they learned. This can serve as a pre and post assessment, as well as provide some insight into where each attendee is coming

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from as far as their knowledge. It may also help determine what material to focus on when teaching future classes if patterns emerge.

It may also be beneficial to add a practical component of the food service manager course. For the 2-day course, perhaps 1 day could be dedicated to didactic learning (the conventional method) and day 2 could be on-site at the food establishment applying the principles learned during the didactic phase. If not feasible for the sanitarian to conduct the practical component one-on-one with students in the class, it may be possible to set up a demo whereby the entire class will be in attendance and called upon to demonstrate their food service management mastery at the establishment.

Additionally, since it is expected that food service managers teach all employees at the food establishment how to comply with the food ordinance, perhaps class members should be observed teaching other classmates the skills taught in the class. Physicians have a saying, “see one, do one, teach one,” which means that you do not fully achieve mastery of a concept until you are able to teach it. This would reinforce knowledge in the classroom.

As mentioned in the introduction, training alone is not sufficient to ensure compliance and applications of lessons learned. Even more important are the attitudes these food service managers have of safe food handling in order to ensure that appropriate standards are met. For this reason, behavioral science interventions inspired by the Theory of Planned Behavior should be utilized to maximize results.

Observation of the process for food inspection similarly yielded helpful information. While the food inspection component has less impact on the certification program, it does have a large role in the enforcement of Section 20-53. As observed during the inspection, verification

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of food service manager certification is requested upon entering the food establishment prior to inspecting the restaurant. This knowledge could potentially bias how the inspection is conducted and ultimately the inspection score. We recommend that verification of the certification be conducted at the end of the inspection so as not to affect the final score.

In conclusion, it does appear that the HDHHS Food Managers' Certification program is effective in improving compliance with the Houston Food Ordinance. Further evaluation of each of the components of the program may prove useful. Future projects should isolate the 4 different methods to obtaining certification in order to see if scores are significantly different. Results from such a study would reveal if efforts do indeed need to be made to standardize the certification process and ensure that all those certified meet expectations. Additionally, further studies separating critical and non-critical violations would be able to show whether the program reduces specifically the critical violations. Implementing the recommendations enumerated here could advance the program and help the Houston Department of Health and Human Services further improve efforts to prevent foodborne illness in Houston.

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