

MICHELLE COTTERCHIO, MS MPH ■ JULIA GUNN, RN MPH
THOMAS COFFILL ■ PATRICIA TORMEY RN MPH ■ M. ANITA
BARRY, MD MPH

Effect of a Manager Training Program on Sanitary Conditions in Restaurants

At the time of this study, Ms. Cotterchio was a graduate student at the Boston University School of Public Health; she is currently a doctoral student at the University of Toronto. Ms. Gunn is a Research Nurse with the Boston Public Health Commission and a doctoral student at the Boston University School of Public Health. Mr. Coffill is the Director of the Division of Health Inspections, Boston Inspectional Services Department. Ms. Tormey is the Program Manager, Communicable Disease Control Program, Boston Public Health Commission. Dr. Barry is the Director of the Communicable Disease Control Program, Boston Public Health Commission, and an Assistant Professor, Boston University Schools of Medicine and Public Health.

S Y N O P S I S

Objective. To evaluate the effectiveness of a food manager training and certification program in increasing compliance with restaurant sanitary codes.

Methods. Using routine sanitary inspection records, the authors compared pre- and post-training inspection scores for 94 restaurants falling into three groups: a "mandatory" group (managers' attendance was mandated for these restaurants); a "voluntary" group (managers attended the training voluntarily); and a control group (no staff attended the training program).

Results. Restaurants for which managers were mandated to attend a training and certification program demonstrated a significant improvement in inspection scores, an improvement that was sustained over a two-year follow-up period. The mean inspection scores for a control group did not change significantly over time. However, improvements were not noted in all areas of food safety.

Conclusions. Food manager training and certification programs may be an effective way to improve the sanitary conditions of restaurants and reduce the spread of foodborne illnesses.

Address correspondence to:

Dr. Barry, Boston Public Health Commission, 1010 Massachusetts Ave., Boston MA 02118; tel. 617-534-5611; fax 617-534-5905; e-mail <mabarry@bu.edu>.

Foodborne illness is a major public health concern. In the United States, 6.5 million to 33 million cases of foodborne illness and 9000 food poisoning deaths are estimated to occur each year,¹ at an estimated yearly cost of up to \$6.7 billion.² A majority of the reported cases of foodborne illness can be traced to public eating establishments.³ Recent increases in the consumption of restaurant food have been accompanied by an increased risk of illnesses being transmitted by food handlers.⁴ In this era of widespread travel and international distribution of products, safe food handling practices are especially important because of the potential for widespread outbreaks of foodborne illness.

Training and certification programs have been introduced to educate restaurant managers in sanitary food handling practices. Because of the cost of training programs, an evaluation of their efficacy is crucial. However, studies assessing the effect of food manager training programs on the sanitary conditions of eating establishments have produced inconsistent and inconclusive results.⁵⁻¹¹ Two studies reported that sanitation inspection scores significantly improved when managers attended a training program, but because there was no control group it is difficult to attribute the changes to training.⁷⁻⁸ Cook and Casey,⁹ Wright and Feun,¹⁰ and Clingman⁶ reported increases over baseline in inspection scores with and without manager training, suggesting that training was unlikely to be responsible for the improvement in scores. And no study has differentiated between voluntary and mandatory attendance at training programs.

The present study evaluates changes in restaurants' sanitary inspection scores following food managers' completion of a training and certification program.

METHODS

The Boston Inspectional Services Department (ISD) is required by state regulations to inspect all food service establishments twice a year. Routine inspections are carried out by trained ISD staff using a standardized form. The inspection identifies 42 types of violations, including items defined as "critical" (likely to be associated with foodborne illness) or "non-critical" (likely to play a minor role in causing illness). Scores are calculated by deleting points, weighted for severity, from a perfect inspection score of 100 (no noted violations); thus inspection scores can range from 0 to 100.

In 1988, a food manager training and certification

program was initiated by the ISD and Boston's health department, the Boston Public Health Commission. The program was mandatory for managers of (a) restaurants with licenses suspended due to conditions being found on inspection that constituted an immediate threat to health or safety and (b) restaurants linked epidemiologically to cases of foodborne illness by the Health Commission using inspection findings, medical histories of these cases, and laboratory reports. Participation in the food manager training and certification program was also available on a voluntary basis. The training covered contamination and foodborne illness; purchasing and receiving safe food; safe food handling; sanitary facilities; pest control; employee training; and safe food service facilities among other topics. Each course lasted 15 hours, and courses were offered at multiple sites.

Only one manager from each restaurant participated in the training and certification program. Managers were certified after completing the course and receiving a passing score of 75 or higher on a standardized written examination.

We analyzed routine inspection records for the years 1989 through 1992 for three groups of restaurants: a "mandatory" group (managers' attendance was mandated for these restaurants); a "voluntary" group (managers attended the training voluntarily); and a control group (no staff attended the training program).

During 1989 and 1990, 62 restaurant managers participated in the program (26 mandatory and 36 voluntary). Pre-training inspection scores were available for 54 (87%) of the 62 restaurants. Controls ($n = 40$) were a randomly selected sample of restaurants in Boston that underwent inspection in 1989 and 1990 and whose managers were not recorded as attendees of the training and certification program during the study period.

We looked at the records of routine inspections conducted before the training (baseline), one year after training (Post 1), and two years after training (Post 2). (Restaurants underwent twice-yearly inspections; we looked at follow-up inspections occurring within one month of the "anniversaries" of the completion of training.) Inspectors were blinded to the restaurant categories (mandatory, voluntary, control). Because inspectors routinely rotated jurisdictions, a single inspector was unlikely to perform all inspections in a given restaurant.

We calculated mean inspection scores for the mandatory, voluntary, and control groups for each time frame (baseline, Post 1, and Post 2). A two-factor

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ANOVA with repeated measures on one factor (*alpha* level = 0.05) was used to test for an overall difference in means. Differences between groups in mean inspection scores were compared using Student's *t*-test. Mean changes in inspection scores between time frames by group were compared using paired *t*-tests, with statistical significance defined as 0.01 to adjust for multiple comparisons. In addition, we used chi-square tests and Fisher's exact tests (*alpha* level = 0.05)¹² to compare the number of "critical" violations in the mandatory and voluntary groups with the number in the control group for each time frame. Data were analyzed using the Statistical Package for the Social Sciences.¹³

RESULTS

A total of 94 restaurants were included in the analysis. The managers of 23 of these restaurants were required to undergo training, the managers of 31 attended training sessions voluntarily, and 40 restaurants served as controls. The seating capacity of these 94 restaurants varied, with 22% having more than 150 seats, 33% having between 50 and 150 seats, and 38% having fewer than 50 seats; size was unknown for 6%. A total of five restaurants (one control, three mandatory, one voluntary) were lost to follow-up due to closure between the Post 1 and Post 2 inspection dates. The overall mean inspection scores were 73 (standard deviation ([SD] = 15) at baseline, 81 (SD = 11) at the one-year follow-up, and 84 (SD = 9) at the two-year follow-up (Table 1). The change from baseline to follow-up differed significantly by restaurant group (ANOVA; $F = 2.63$; $P = 0.04$).

At baseline, mean inspection scores were 66 (SD = 15) for the mandatory group, 74 (SD = 16) for the voluntary group, and 77 (SD = 14) for the control group.

The baseline score for the mandatory group was significantly lower than the baseline score for the control group ($P = 0.004$).

One year post-intervention, the mean inspection score for the mandatory group increased by 14.7 points ($P = 0.007$), and the mean score for the voluntary group increased by 7.5 points ($P = 0.03$) (Table 1). These improvements were maintained at the two-year follow-up inspection. The mean inspection score for the control group did not change significantly over time.

At baseline, restaurants in the mandatory group were significantly more likely than control restaurants to have inadequate holding temperatures ($P = 0.02$), inadequate plumbing ($P = 0.05$), nonfunctional toilet and handwashing facilities ($P = 0.005$), and improper storage of toxic items ($P = 0.005$) (Table 2). Restaurants in the voluntary group were significantly more likely than controls to have toxic items improperly stored ($P = 0.01$). One year after participation in the training program, improvements were noted in each of these problem areas for both voluntary and mandatory attendees, with improvements sustained at the two-year follow-up (although the voluntary and mandatory groups did not differ significantly from controls in any of these problem areas at the one-year or two-year follow-up).

DISCUSSION

The outcome of interest for food manager training programs is the incidence of restaurant-associated foodborne illness. However, methods for complete reporting of foodborne illness are limited. Most studies, including ours, use restaurant inspection scores as a proxy measure since a correlation has been noted between foodborne illness and inspection scores.¹⁴⁻¹⁵ Improper food handling practices (inadequate holding temperature)

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We found that the mean inspection score increased 14.7 points for the mandatory group from baseline to one year post-intervention, and 7.5 points for the voluntary group. This improvement in scores was maintained at the two-year follow-up. In contrast, the control group's inspection scores remained fairly constant, suggesting that improvements in the mandatory and voluntary groups could have been due to the training program.

We also found that the average number of critical violations for the intervention restaurants had decreased significantly one year after a manager training and certi-

fication program was offered and that the improvement was sustained over at least two years. This reduction in the number of critical violations included both procedural (storage of toxic material) and structural (hand-washing facilities) deficiencies. However at two years, deficiencies continued to be noted in all three groups of restaurants with respect to food holding temperatures, equipment and utensil sanitizing procedures, and the presence of insects and rodents. These findings suggest that our food manager training and certification program had a limited impact on these problem areas. Additional research is needed on the effect of other educational approaches and of targeting other groups such as food service workers or owners.

Table 1. Mean restaurant inspection scores at baseline and one and two years post-intervention, Boston, 1988–1992 (N = 94)

Group	Baseline ^a		Post 1		Change in scores ^b (Post 1 minus baseline)	Post 2		Change in scores (Post 2 minus Post 1)	Overall	
	Mean	SD	Mean	SD		Mean	SD		Mean	SD
Mandatory	66	15	81	12	14.7 ^b	83	10	3.3	76	7
Voluntary	74	16	81	11	7.5	84	7	3.5	80	8
Control	77	14	80	10	3.2	83	9	3.9	80	8
Total	73	15	81	11	—	84	9	—	—	—

NOTE: Post 1 inspections took place one year after training, and Post 2 inspections took place two years after training. At baseline and Post 1: Mandatory $n = 23$; Voluntary $n = 31$; Control $n = 40$. At Post 2, five restaurants were out of business: Mandatory $n = 20$; Voluntary $n = 30$; Control $n = 39$.

^aDifference between mandatory and control groups significant at the $P = 0.004$ level

^bDifference between baseline and Post 1 significant at the $P = 0.007$ level

SD = standard deviation

Table 2. Percentage of restaurants with critical violations on inspection, Boston, 1988–1992 (N = 94)

Critical violation	Baseline Percent	Post 1 Percent	Post 2 Percent
Food spoilage			
Mandatory	0	4	0
Voluntary	3	0	3
Control	5	0	5
Failure to meet food holding temperature			
Mandatory	48 ^a	17	20
Voluntary	29	26	3
Control	20	20	21
Inadequate facilities to maintain food holding temperature			
Mandatory	4	4	0
Voluntary	3	10	3
Control	0	0	3
Reuse of unwrapped and potentially hazardous food			
Mandatory	0	0	0
Voluntary	0	0	0
Control	0	0	0
Failure to restrict personnel with infections			
Mandatory	0	0	0
Voluntary	0	3	0
Control	3	0	0
Poor handwashing and hygiene			
Mandatory	30	9	5
Voluntary	23	7	7
Control	18	8	0
Inadequate sanitizing of equipment, utensils			
Mandatory	70	30	35
Voluntary	42	19	27
Control	48	28	21
Unsafe water source			
Mandatory	17	0	5
Voluntary	7	3	0
Control	5	8	0
Inadequate waste water disposal, sewage			
Mandatory	0	0	0
Voluntary	0	0	0
Control	8	0	0
Inadequate plumbing: cross-connection, back siphonage, backflow			
Mandatory	35 ^b	13	10
Voluntary	7	0	10
Control	13	5	13
Nonfunctional toilet, handwashing facilities			
Mandatory	48 ^c	17	5
Voluntary	29	10	0
Control	15	15	3
Insects/rodents			
Mandatory	70	35	45
Voluntary	45	36	30
Control	48	38	41
Improper storage of toxic items			
Mandatory	44 ^d	13	10
Voluntary	39 ^e	10	7
Control	13	15	10

NOTES: Post 1 inspections took place one year after training, and Post 2 inspections took place two years after training. At baseline and Post 1: Mandatory n=23; Voluntary n=31; Control n=40. At Post 2, five restaurants were out of business; thus: Mandatory n = 20; Voluntary n = 30; Control n = 39. Critical violations are defined as violations likely to be associated with foodborne illness. P values are reported for comparisons with control groups.

^aP = 0.02 ^bP = 0.05 ^cP = 0.005 ^dP = 0.005 ^eP = 0.01

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Several factors should be considered in evaluating these data. First, the improvement in the mandatory group's scores may have resulted from the combined effect of the training program and a perceived threat of closure. In addition, the two-year follow-up inspection score for the mandatory group may have been biased by the loss of three restaurants due to closure; only one restaurant closed in each of the other groups. Bias in inspection scores due to historical events (that is, increased media coverage of foodborne illness outbreaks) may have played a role, but the inclusion of a control group would be expected to minimize this factor. Although standardized inspection forms were used, the possibility of observer bias on the part of the health inspector cannot be excluded—although any potential bias should have been minimized by inspectors' periodic rotation between jurisdictions. Information on other

possible confounders (that is, prior education of the food manager) was not available. In addition, there was no way to determine if managers changed restaurants or worked at more than one restaurant.

In conclusion, this study provides support for the hypothesis that food manager certification training programs can have a positive effect on the sanitary conditions of restaurants, especially those with initially low baseline inspection scores. Our results suggest that manager training can result in sustained improvement in sanitary conditions of public establishments and offers the potential to reduce the incidence of foodborne illness.

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