THE EFFECTIVENESS OF FOOD SAFETY INTERVENTIONS

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The conclusions of the reviews are based on the available evidence. They do not necessarily represent the views of the Public Health Branch, Ministry of Health and Long Term Care. This report may be copied for circulation as appropriate. Please ensure that the PHRED Program, Public Health Branch, Ministry of Health and Long Term Care is acknowledged.
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PREFACE

Research is one component in evidence-based decision-making, along with past experience, patient preference and available resources. Making research results available to consumers, practitioners, policy-makers and other researchers is essential to fostering evidence-based practice and decision-making. In the Province of Ontario’s public health, health promotion and primary care areas, lack of access to research evidence can be a barrier to using research in policy and practice.¹,²

The Public Health Branch of the Ministry of Health and Long Term Care in Ontario and the City of Hamilton fund the Public Health Research, Education and Development (PHRED) Program in Hamilton. A similar program is in place in four other health units across the province. One role of the PHRED Program is to conduct and disseminate clinically relevant public health, health promotion and primary care research, and to foster evidence-based practice and policy-making.

The Effective Public Health Practice Project (EPHPP) is one initiative within the PHRED Program. This project involves public health researchers, practitioners, and policy-makers from across the province. The EPHPP project members conduct systematic reviews that evaluate the effectiveness of relevant interventions. This project, coordinated from the City of Hamilton PHRED, has produced numerous reviews and summary statements on the effectiveness of interventions for the Ministry of Health and Long Term Care, Public Health Branch. Work is ongoing.

Professional collaboration ensures high-quality scientific work that is clinically relevant to consumers, practitioners and policy-makers. Members of the PHRED Program located in each of the health units have links with faculties such as Health Sciences, Dentistry, Nursing, Nutrition, Medicine, Environmental Health and Geography at their local universities. The EPHPP also has links to the Cochrane Collaboration, an international research initiative, committed to summarizing and making the highest quality research available worldwide.

The EPHPP is committed to on-going consultation with health units within the province to define and review appropriate public health topics, and to collaboration with other groups equally committed to evidence-based practice and decision-making. In this way, the EPHPP continues to develop research which is timely, evidence-based, and relevant to the delivery of public health services in Ontario.


EFFECTIVENESS OF FOOD SAFETY INTERVENTIONS

Public Health Mandate
Public Health Units in Ontario are responsible for reducing morbidity and mortality associated with foodborne diseases under the Food Safety Standard. Public health staff must reduce the incidence of foodborne illness by assessing all food premises annually to determine their risk status, inspecting all food premises at least once per year (dependent on risk status), ensuring that food handling training courses are provided to food handlers in high and medium risk food premises, and providing food safety information to the community.

Background
Foodborne diseases are a significant cause of morbidity in Ontario with an estimated 280 outbreaks (approximately 70 per year) affecting 3,057 individuals (765 per year) for the period 1993 to 1996. It is generally felt these numbers represents only a fraction of the problem.

Issue
Public health staff must ensure that food handlers, both commercial and general public, are aware of effective food safety practices for the reduction of the presence and transmission of infectious diseases via food.

Finding the Answers
A systematic search of twenty electronic databases, reference lists and key informants produced fifty-five relevant studies of which seven were found to have sufficient quality to provide evidence.

What is the Evidence?
The following interventions were found to be successful in promoting food safety:

- three of the five interventions promoting food handler training/certification were found to be effective in enhancing
food safety knowledge and behaviour among food handlers.

- one of the three studies interventions promoting routine inspection were found to be effective in enhancing inspection compliance.

### Implications for Practice and Research

**Practice:**
1. Public health staff provide, facilitate or promote food handler training/certification to food handlers.

2. Public health departments provide routine inspections of restaurants

**Research:**
1. Methodologically rigorous evaluation research should be undertaken in Ontario to assess the effectiveness of diverse health promotion and protection interventions for enhancing food safety interventions.

2. Particular attention should be directed to assessing the effectiveness of any food safety intervention.

3. The scope of evaluation research should be expanded to include a larger variety of food safety interventions. Areas to be examined should also include evaluation research on regulatory strategies (issuing of tickets/orders/closures) and inspection disclosures in various formats and their impact on compliance with standards.

### Source of Information


### Summarized by

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What is the evidence?
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- three of five interventions promoting food handler training/certification were found to be effective in enhancing food safety knowledge and behaviour among food handlers.

- one of three interventions promoting routine inspection were found to be effective in enhancing inspection compliance.

Implications
- That public health staff use the above interventions to enhance food safety practices and policies.
• That evaluation research be performed on current public health food safety promotion and protection interventions to determine the effectiveness of enhancing prevention and control practices.

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Abstract

Objective:

The purpose of this study was to summarize evidence on the effectiveness of food safety interventions.

Method:

A comprehensive literature search was performed. Retrieved articles were relevance tested and those that passed were then assessed for quality and the data extracted and synthesized.

Results:

Of the 55 relevant articles captured during the 2000 literature search, seven were rated as moderate and were included in this review. The remaining 48 articles were rated as weak and, therefore, were excluded. Some public health infection control interventions (4/7) are effective in food safety interventions. Food handler training/certification (3 studies) is effective in enhancing food safety knowledge and behaviour among food handlers. Routine inspection (1 study) is effective in enhancing inspection compliance.

Conclusion:

Evidence was found that some public health food safety interventions are effective.
BACKGROUND

Introduction

Under the Ontario Mandatory Health Programs and Services Guidelines, December 1997 Appendix 1), the goal of boards of health is to improve the health of the population by reducing the incidence of foodborne illness (Minister of Health, 1997). This systematic review was undertaken to provide evidence of the effectiveness of public health food safety interventions to reduce illnesses transmitted via food for premises where food is prepared, stored, served or sold, and included restaurants, institutions, homes and other community-based settings.

Foodborne Illness in Ontario

Enteric diseases affect the gastrointestinal tract and many are attributable to microbial (bacteria, viruses, and parasites) or chemical contamination of food or water. Diseases that are acquired by consumption of contaminated food are referred to as foodborne diseases. Examples of microbial-related foodborne disease are botulism, brucellosis, Campylobacter enteritis, cholera, hepatitis A, listeriosis, paratyphoid fever, salmonellosis, shigellosis, trichinosis, tularemia, typhoid fever, verotoxin-producing Escherichia coli infections, and yersiniosis (Isaacs, S., LeBer, C., and Michel, P., 1998). Some diseases, such as hepatitis A, are spread by other means, but the majority of infections still arise from the ingestion of the infectious agent. (Public Health Research, Education and Development Program, 2000).

Many foodborne diseases are spread via the fecal-oral route. Incomplete cooking, inappropriate storage of food, or cross-contamination of food (by the inadvertent transfer of organisms from contaminated raw food to “ready-to-eat” food) are common ways by which food becomes contaminated. According to Olsen, S., MacKinnon, L., Goulding, J., Beank N., and Slutsker, L., (2000), the most commonly reported food-preparation practice that contributed to foodborne disease was improper holding temperature; the second most commonly reported practice was inadequate cooking.

According to the United States Centers for Disease Control, only a fraction of foodborne illnesses are reported to their surveillance system because of the complex chain of events that must occur before a foodborne illness is reported. A break at any point in this chain will result in a case not being reported. In addition, most reported illnesses are sporadic in nature and only a small number are identified as being part of an outbreak (Olsen, et al., 2000).

In Ontario, overall surveillance of enteric diseases is achieved via the Reportable Diseases Information System (RDIS). Local public health units report disease events to a centralized information system. Outbreak occurrences of enteric disease are documented in the outbreak module of RDIS. Sporadic cases are reported separately using a case-by-case reporting module of the same system (Isaacs, et al., 1998).

According to RDIS, an outbreak is defined as the occurrence of two or more cases of enteric illness linked in terms of times, exposure to source, and most often location. The RDIS reports mode of transmission including person-to-person, vector borne, food as a vehicle, water as a vehicle, direct contact with an animal, or other (Middleton, D., 1999).
Data was compiled on the distribution of foodborne disease by risk setting using RDIS outbreak data for the years 1993 to 1996 and a previously created file of reported sporadic cases for the period 1990 to 1994. The events were limited to those classified as “food poisoning” or those with the mode of transmission identified as food regardless of the disease organism involved (Isaacs, et al., 1998). The results were as follows:

- There were 1348 outbreaks of enteric disease (approximately 340 per year) for the period 1993 to 1996.
- Over half (760) of the outbreaks were associated with person-to-person transmission, an association with food as the original source of infection was not known. The mode of transmission was not identified in 304 outbreaks.
- There were 280 outbreaks (an average of 70 per year) with food identified as the source of illness.
- The number of cases involved per outbreak was reported in 89% (248/280) of the outbreaks. The cases totalled 3,057 or 765 per year – an average of 12 cases per outbreak.
- The number of cases was not reported in 11% of these outbreaks.

Figures 1a and 1b display the risk setting for the 280 outbreaks and cases of foodborne diseases reported between 1993 and 1996. The vast majority are related to restaurants, private homes, health care institutions, catered food, and fast food. Clubs, churches, hotel/motels, daycare centres, resorts, and cafeterias account for a small number.

Figure 2 displays information regarding the sporadic cases of foodborne diseases from 1990 to 1994 for salmonellosis, Campylobacter enteritis, and verotoxin-producing E. coli (VTEC) infection, accounting for 80% of all reportable enteric diseases in Ontario, excluding giardiasis. During this five-year-period, 10,028 sporadic cases were reported. Private homes are the risk setting for most reported sporadic occurrences, followed by restaurants, travel, workplace, school, and other.

**Review Background, Research Question and Project Objectives**

In 1997, a systematic review entitled “Food Safety: Program Descriptions and a Systematic Review of the Effectiveness of Documented Interventions” was produced by Campbell, M., Gardner, C., Leung, J., Dwyer, J., Isaacs, S., Krueger, P., and Ying J., 1997 for the Ontario Ministry of Health. Food safety interventions applicable to public health practice in Ontario were identified and their effectiveness assessed. The food safety interventions focussed on premises where food is prepared, stored, served, or sold, and included restaurants, institutions, homes, and other community-based settings. In addition, the findings of descriptive studies were also reported.

**The research questions of the 1997 Food Safety Review were:**

1. What are the documented interventions that public health can use to ensure that food is prepared, stored, served/sold in a safe manner consistent with acceptable local public health practices?
2. What is the effectiveness of these interventions?
3. Are there reliable measures of the effectiveness of these food safety interventions?
Figure 1: Distribution of foodborne disease outbreaks (a) and cases of foodborne disease associated with outbreaks (b) by risk setting, Ontario, 1993 to 1996. An enteric outbreak is defined as the occurrence of two or more cases of enteric illness linked in terms of time, exposure to source, and most often location (Middleton D, 1999). Outbreak occurrences of enteric disease are reported and documented in the outbreak module of RDIS. Sporadic cases are reported separately using a case-by-case reporting module of the same system (Issacs et al., 1998).

Source: Isaacs et al., 1998
The 1997 Review has been well received and used by members of the public health food safety field. The Effective Public Health Practice Project (EPHPP) decided that an update of the 1997 systematic review would be timely and valuable to food safety practitioners.

The research question was updated by the 2000 Literature Review Committee, and is:

“**What is the effectiveness of public health interventions to ensure that food is prepared, stored, served/sold in a safe manner to the public?**”

A broad systematic review was undertaken to encompass the extensive strategies and diverse scope of public health interventions and infection control applicable to the Mandatory Health Programs and Services Guidelines for Food Safety, particularly those interventions specifically designed for premises where food is prepared, stored, served, or sold. The interventions include restaurants, institutions, homes, and other community-based settings.

The interventions included a variety of health protection and promotion strategies, such as educational sessions and policy development. Outcomes as shifts in knowledge and behaviours by food handlers, managers, operators, establishment owners, and the general public that could result in the reduction of foodborne illnesses were assessed.
METHODS

Overall Design

2000 Literature Review Committee

The overall direction for this review was provided by the 2000 Literature Review Committee (Appendix 2). The Literature Review Committee was composed of public health practitioners with substantial food safety expertise and methods experts who assessed the quality of the relevant studies. Specific tasks undertaken by the Literature Review Committee, or subgroups within this Committee, were as follows:

- definition of the research question to ensure that the resulting systematic review was useful to public health practitioners,
- identification of key search terms,
- assistance with identification of key informants and unpublished studies,
- performance of the quality assessment and data extraction phase,
- review of the draft documentation, and
- creation of appropriate recommendations for research and practice.

The Literature Review Committee was formed in October 1999 and completed its work in January 2001.

Search Strategy

The literature search involved a comprehensive computer-based search for nationally and internationally published studies and a search for unpublished Canadian studies. The search was conducted in December 1999. Studies received after September 30, 2000 were not subjected to relevance or quality assessments, and therefore were not available for inclusion in this review. For the purposes of this systematic review, an article is defined as a manuscript, either published or unpublished. A study is the intervention, its description, evaluation, etc.

The computer-based search strategy for published studies was planned independently by two librarians incorporating the key search terms provided by the 2000 Literature Review Committee. Through consultation with the 2000 Literature Review Committee, the two librarians developed the final search strategy (Appendix 3). The databases AGRICOLA, ASTA, BIOSIOS, CINAHL, Cochrane Library, Current Contents, EI Compendex, Dissertation Abstracts, Embase, Enviroline, Environmental Bibliography, ERIC, Food Science & Technology Abstracts, Foodline, Medline, NTIS, PsycINFO, SCI, and Wilson Social Sciences Abstracts were searched. The search included primary studies and reviews, and publications in French or English from 1975, or whenever the computer database began, forward.

The following journals of key importance to public health practice were handsearched from 1995 to 1999: American Journal of Public Health, American Journal of Epidemiology, American Journal of Health Promotion, Canadian Journal of Public Health, Environmental Health, Health Education and Behaviour, and Health Promotion International.

Unpublished studies were retrieved using four strategies:
1. direct request of key staff in all Ontario health units and all provincial and territorial Ministry of Health agencies,
2. direct request via the USDA food safety list serve,
3. search of student theses through the Dissertation Abstracts database, and
4. key informants including researchers in food safety.

**Screening Process for Relevance**

Retrieved articles were screened using a relevance tool modified to criteria specified by the 2000 Literature Review Committee (Appendix 4). The generic tool was provided by the EPHPP. All study designs were included.

Screening for relevance was done by one committee member to provide consistency in the interpretation of the tool and divided among four other committee members for second appraisal. The two appraisals were compared and where there was disagreement, discussion ensued until consensus was reached. The reference lists of all articles were reviewed for potentially relevant articles.

**Quality Assessment**

A generic quality assessment tool was designed by the EPHPP in collaboration with previous systematic review authors (Appendix 5). The quality of each study was determined using a score based on the following six components: selection bias, study design, control for confounders, blinding, data collection methods and withdrawals and dropouts.

Initially, a study was rated as “strong” if it had four strong and no weak component ratings; “moderate” if it had less than four strong component ratings and one weak rating, and “weak” if it had two or more weak component ratings. Any component resulting in a “can’t tell” response was assessed as weak by default. This rating method was modified when the observation was made that many studies were rated as weak even though four of the six components were rated strong or moderate. The “can’t tell” response was usually due to insufficient information available in the document rather than evidence of methodological weakness in the study.

**Data Extraction**

A data extraction tool was developed to ensure consistency among the reviewers in extracting the data from the studies (Appendix 6). Two reviewers independently extracted data from relevant studies rated moderate or strong. The two appraisals were compared and where there was disagreement, discussion ensued until consensus was reached.

**RESULTS**

**Outcome of Search and Screening Process**

The search for published and unpublished studies captured a large number of potentially relevant articles. After the initial screening of the abstracts to capture any article that described a food safety intervention plus the inclusion of potentially relevant articles from the 1997 review and identified during a search of the reference list from relevant articles, a total of 132 articles were selected for retrieval. Of the 112 articles retrieved by the cut-off date, 55 passed the relevance test (See Appendix 7 for a flow chart describing the retrieval process). Potentially relevant articles that were not retrieved in time to be included in this review are listed in Appendix 8.
Characteristics of Relevant Studies

The characteristics of the 55 relevant studies are summarized in Table 1. Just over half the studies (30/55) were published in the 1990s. The most common design used to evaluate the food safety interventions was cohort one group pre + post (before and after) (22/55). Controlled trials accounted for nine of the 55 studies, of which eight were randomized controlled trials (RCT). The majority of studies evaluated food handler training/certification (41/55).

To help examine the effectiveness of the food safety interventions, interventions were clustered into the following categories:

- **Food handler training/certification:** interventions that are directed at and implemented with the food handler/manager
- **Inspection:** interventions that alter the inspection frequency of the food premises
- **Community-based education:** extensive public education interventions directed at the general population or several targeted subpopulations
- **Other:** interventions not classified by the above definitions

Results of Quality Assessment Phase

Application of the quality assessment tool resulted in a moderate assessment for seven of the 55 relevant studies. No studies were rated strong. The quality assessment component ratings for the 55 studies is shown in Appendix 9.

Results of Data Extraction Phase

**Interventions of Included (Strong or Moderate) Studies**

The seven studies designated as of moderate methodological quality were subjected to data extraction. A description of the interventions and outcomes of these studies is provided in Table 2 and discussed below.

Cotterchio, M., Gunn, J., Coffill, T., Tormey, P. and Barry, M.A. (1998) evaluated a food manager training and certification program and found it to be effective in increasing compliance with restaurant sanitary codes. Inspection scores were found to increase significantly when managers attended the program. The intervention consisted of a mandatory program for managers of restaurants with licenses suspended due to conditions found on inspection that constituted an immediate threat to health or safety, and managers of restaurants linked epidemiologically to cases of foodborne illness through inspection findings, medical histories, and laboratory reports. In addition, the program was also available on a voluntary basis. The program covered such topics as contamination and foodborne illness, purchasing and receiving safe food, safe food handling, sanitary facilities, pest control, employee training, and safe food service facilities. Each program lasted 15 hours and was offered at multiple sites. Only one manager from each restaurant participated and was certified after completing the program and receiving a passing score on a standardized written examination.
Rinke, W.J., Brown, N.E. and McKinley, M.M. (1975) compared two food safety training methods, live instruction and audiotape instruction, and found the methods to be equally effective at increasing food safety knowledge. The live method included a slide show plus commentary and questions presented by an instructor, with opportunity for participants to respond to questions. The taped version included the same commentary and questions, but these were presented as a synchronized slide-tape program without an instructor present. Significant improvements in knowledge were found in both groups.

Computer-assisted instruction (CAI) was found to be as effective as a lecture method of instruction for teaching sanitation to hospital foodservice employees in a study by Waddell, K.P. and Rinke, W.J. (1985). The CAI sanitation lesson was based on the synchronized slide-tape sanitation program developed by Rinke et al., (1975). The first part of the slide-tape presentation was programmed in tutorial mode for use on a computer. The program was composed of five lessons and two review sessions. The completed CAI program consisted of basic principles of sanitation and included characteristics of bacteria, elements required for growth, techniques for controlling bacteria, and personal hygiene. The lecture program used a prepared script and supporting slides. Questions were limited to those that supported the instruction. Both groups were found to significantly improve food safety knowledge after the interventions.

The effectiveness of a food hygiene training course was evaluated by Ehiri, J.E., Morris, G.P. and McEwen, J. (1997) and was found to produce no significant improvement in participants’ overall knowledge of a number of crucial aspects of food safety including food storage, cross contamination, temperature control, and high-risk foods. The intervention consisted of the elementary food hygiene training course of the Royal Environmental Health Institute of Scotland. However, the intervention group performed significantly better on a number of the tested knowledge variables than the comparison group.

Kirshner, B. (1990) randomly assigned non problem food establishments to receive on-site educational sessions or to not receive educational sessions and then within each of the two groups randomly assigned food establishments to receive a regimen of two, four or six inspections a year. An index based on the 20 content areas outlined in the public health inspection guidelines was developed as the primary outcome measure in the study. The inspection scores between establishments receiving the onsite educational sessions and not receiving the sessions did not differ in the number of infractions. Also, there was no difference in infractions between groups assigned to regimens of two, four or six inspections.

Bader, M., Blonder, E., Henriksen, J. and Strong, W. (1978) randomly assigned restaurants to be inspected four times per year or only upon complaint by a patron. After two years, all restaurants were inspected and the inspection scores compared. The inspection scores for premises inspected four times per year were better than the premises inspected only upon complaint by a patron. While this study indicated that regular inspection results in a lower violation rate than compliant response, it does not indicate the optimal inspection frequency.

Corber, S., Barton, P., Nair, R., and Dulberg C. (1984) stratified 400 eating establishments by size and complexity then randomly assigned the establishments in each group to inspections six, nine or twelve times per year. The inspection regime continued for 17 months. The results showed that raising the frequency of inspections from six to 12 times per year, does not, on average, reduce the number of defects or violations.
In summary, four of the seven studies provided good evidence to support the effectiveness of the food safety interventions with positive results for the main outcome measured. Three of the studies (Cotterchio et al., 1998; Rinke et al., 1975; Waddell & Rinke, 1985) provided evidence for the effectiveness of food handler training/certification. A study by Ehiri et al. (1997) found that there was no significant improvement in knowledge about a number of crucial aspects of food safety following food handler training. However, the intervention group performed significantly better on a number of the tested knowledge variables than the comparison group. Kirshner (1990) found no difference in the number of infractions between food handlers who had onsite education than food handlers who did not. Studies for food handler training/certification were of two types: those that linked training/certification with changes in inspection scores, reflecting a change in food handling practice (Kirsher 1990; Cotterchio et al., 1998) and those that linked training/certification with changes in knowledge (Rinke et al., 1975; Waddell & Rinke, 1985).

Three studies provided evidence on the effectiveness of inspection. One study, (Bader et al., 1978) found regular inspection resulted in a lower violation rate than complaint response alone. Kirshner (1990) and Corber et al. (1984) found no differences in violations with increased frequency of inspection.

**Interventions of Excluded (Weak) Studies**

The majority of the relevant studies (48/55) were assessed as weak for methodological quality. Many of the interventions assessed as weak are applicable to public health practice for promoting food safety. If evaluated using a rigorous research design, the intervention might prove to be effective. The relevant weak studies are documented under two general categories: the intervention description and the evaluation method description (Appendix 10). The intervention description includes the intervention’s goal, strategy, description, setting, target, agency, and intervenor. The evaluation description includes the evaluation design, outcome measure(s), and comments on the evaluation. As the evaluation has been rated as being of weak methodological quality, evaluation results are not described. The original descriptions as assessed in the 1997 Food Safety Review are designated with “1997” after the title, “Description of Intervention”.

**DISCUSSION**

This systematic review was undertaken to provide evidence of the effectiveness of public health food safety interventions for premises where food is prepared, stored, served, or sold and included restaurants, institutions, homes, and other community-based settings. There exists a wealth of descriptive information on foodborne infectious agents and many of the authors provide suggestions for prevention of foodborne illness. This search found evidence to support the suggested infection control measures to be lacking. The review revealed for the most part, that the literature was methodologically weak. Of 55 studies relevant for this review, only seven studies were rated as of moderate methodological quality and were included in the review. The remaining 48 studies were rated as weak and were excluded. Therefore, the review can provide very limited evidence based on six interventions. This review revealed little evidence for most of the Mandatory Health Programs and Services Guidelines (MHPSG) for food safety (e.g., frequency of inspection of premises, provision of community-based education, etc.)
The effectiveness of food handler training/certification was found to be positive in three of the moderate studies (Cotterchio et al., 1998; Rinke et al., 1975; Waddell & Rinke, 1985). There was a lack of evidence in two of the moderate studies (Kirshner, 1990; Ehiri et al., 1997) to support food handler training/certification. Those who received food handler training performed significantly better on a number of tested knowledge variables than the comparison group (Ehiri et al., 1997). One study (Bader et al., 1978) provided evidence to support the use of regular inspection. Increased frequency of inspection did not reduce violations in two studies (Kirshner, 1990; Corber et al., 1984).

It should be noted that the 2000 EPHPP quality assessment tool rated many of the moderate and strong studies (10/14) from the 1997 Food Safety Review as weak. The 1997 Food Safety quality assessment tool was designed to be comparable to other quality assessment tools reported in the literature at that time. Overall validity of the studies was determined on the basis of three major criteria:

1. the comparability of the intervention and the comparison groups;
2. the assessment of the intervention(s); and
3. the assessment of the outcome(s).

The appraisers indicated whether they had no concerns, minor concerns, or major concerns for each of the methodological criteria. The overall rating of the study was determined to be: “strong” if there were no major concerns and few minor concerns; “moderate” if there were no major concerns but a significant number of minor concerns; or, “weak” if there was one or more major concerns. Although the tool did not include specific questions to assess each criterion (e.g., were data collection tools shown to be valid?), an assumption was made that the appraisers would consider such questions when rating each methodological criterion. The 2000 EPHPP quality assessment tool removed this subjectivity by listing specific questions to be answered for each methodological criterion.

Most studies failed to indicate whether the intervention resulted in any change in knowledge or practice by the target population. Instead, an assumption was made that any increase/reduction in inspection scores (dependent on the scoring system) was directly related to the intervention provided to restaurant staff. No evidence was provided showing that the staff changed their practices or that any such changed practice was directly responsible for change in inspection scores.

It is important to note that none of the studies adequately evaluated inspection programs based on Hazard Analysis Critical Control Point (HACCP) protocols, as implemented by public health staff. This finding was also noted in the 1997 Food Safety Review. In addition, none of the studies adequately evaluated food safety community-based education.

The weak ratings do not necessarily indicate that the interventions were ineffective, but rather that either the evaluation lacked proper design or that the authors failed to provide sufficient information regarding selection of the subjects, assessment and control of confounders, and follow-up rate of withdrawals and drop-outs in the target population. Those assessed to be weak in the three categories were excluded from the review.

It is very likely that some unpublished studies were missed in the search process. In addition, a number of theses from various countries were captured by the literature search; however, many could not be retrieved within the review time limit. A limitation of the quality assessment phase was score results for components with insufficient information provided by the study, e.g., blinding information for outcome assessor or study participants, or control of confounders. It may have been appropriate to pursue these questions further by seeking clarification from the
study author. The time frame available for completion of this review did not allow for the possibility of this option.

Despite these limitations, this systematic review does provide some evidence for the effectiveness of food safety interventions that are applicable public health practices for protecting the public from infection risks. Although effectiveness has been demonstrated for a small range of interventions, it is reasonable for health practitioners to consider applying these interventions and particularly to apply them in the context of the MHPSG.

CONCLUSIONS

- Evaluation research on the effectiveness of food safety interventions is not a relatively recent activity, with (24/55) of relevant evaluation studies conducted prior to 1990.
- Many relevant studies (41/55) focused on food handler training/certification. The remaining studies were either inspection (18/55) or community-based education (6/55).
- The majority (48/55) of relevant evaluation studies were of poor (“weak”) methodological quality and therefore, not useful in evidence-based public health practice.
- The majority of relevant studies, contained no description of the target population, selection, confounders, withdrawals, or drop-outs, nor was evidence provided to show that the target group’s knowledge and behaviour were affected by the intervention and consequently, effected the change in the measured outcomes. The outcome, in many cases inspection scores, was not shown to be directly related to the intervention.
- The majority of research designs were cohort one group pre + post (before and after) (22/52).
- Rigorous evaluation research (7/55) on the effectiveness of food safety interventions is remarkably scarce.

Of the 55 relevant studies subjected to quality assessment, seven studies were of moderate methodological quality. Despite this, it is important to recognize that the lack of good quality studies (i.e., moderate or strong) does not mean that the interventions evaluated are not effective. Effectiveness was not documented.

The following conclusions apply to the seven ‘moderate’ studies included in this review:
- Some public health infection control interventions are effective in food safety interventions (4/7).
- Food handler training/certification is effective in enhancing food safety knowledge and behaviour among food handlers (3/5).
- Routine inspection is effective in enhancing inspection compliance (1/3).

RECOMMENDATIONS

Based on the information compiled through this literature review, the following recommendations are provided.
Recommendations for Research:

1. Methodologically rigorous evaluation research should be undertaken in Ontario to assess the effectiveness of diverse health promotion and protection strategies in enhancing food safety interventions in public food outlets as well as the community at large.

2. Particular attention should be directed to assessing the effectiveness of any food safety intervention.

3. The scope of evaluation research should be expanded to include a wide variety of food safety interventions. Areas that could be examined are inspection programs based on Hazard Analysis Critical Control Point (HACCP) protocols, regulatory strategies (issuing of tickets/orders/closures) and inspection disclosures in various formats and their impact on compliance with standards.

This review found a limited number of articles providing evidence for the effectiveness of food safety interventions. There is a need for development and implementation of methodologically rigorous research to assess a broader range of food safety interventions as described in the MHPSG.

The majority of studies identified in this literature review were of poor quality and therefore not useful in guiding public health practice. Health unit staff undertaking program design and/or evaluation should consult with experts in the field of study design and evaluation in the early stages to ensure methodological rigour. A supplement to the Evaluation Tool Kit could be prepared to inform evaluation teams as to the requirements for methodologically rigorous evaluation design. Evaluators of the public health interventions also need to know what factors contribute to quality assessment of a study.

Recommendations for Practice:

1. Public health staff provide, facilitate or promote food handler training/certification for food handlers.

2. Public health departments provide routine inspections of restaurants

Because the existing research falls short of the scientific rigour required for drawing conclusions, it fails to provide the evidence necessary to justify or validate current standards set out in the MHPSG. In no way does this call such programs or standards into question but rather points to the need for further careful studies of these time-honoured, pragmatically endorsed practices. The dearth of both quantity and quality of methodologically rigorous studies in the existing pool of literature points to the need for more research. Certainly the 55 relevant studies provide a well-defined foundation on which to build future scientific study.
References


TABLES

Table 1: Characteristics of Relevant Studies

Table 2: Summary of Interventions and Outcomes for Studies Rated ‘Moderate’ Methodologically
### Table 1. Characteristics of Relevant Studies

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No. Studies with Specific Characteristic (n = 52)</th>
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<td>1</td>
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<td>17</td>
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<td>11</td>
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<tr>
<td>1</td>
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</tr>
<tr>
<td>7</td>
<td>Cohort analytical</td>
</tr>
<tr>
<td>22</td>
<td>Cohort (one group pre + post (before and after))</td>
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<tr>
<td>5</td>
<td>Time series</td>
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<tr>
<td><strong>Intervention type</strong></td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>Food handler training/certification</td>
</tr>
<tr>
<td>18</td>
<td>Inspection</td>
</tr>
<tr>
<td>6</td>
<td>Community-based education</td>
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</tbody>
</table>

**studies may include multiple intervention types**
Table 2. Summary of Interventions and Outcomes for Studies Rated ‘Moderate’ Methodologically

<table>
<thead>
<tr>
<th>Study (Country)</th>
<th>Design (Quality assessment)</th>
<th>Intervention</th>
<th>Outcome</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cotterchio et al., 1998 (United States)</td>
<td>Cohort analytical (moderate)</td>
<td>Intervention: Food handler training/ certification</td>
<td>Significant increases were found in the inspection scores for restaurants when managers were mandated to attend the program (p = .007). Improvement was sustained over a two-year period. Significant increases in inspection scores were also found for the voluntary group (p = .03). Improvement was sustained over a two-year period. Inspection scores for the control group did not change significantly over time.</td>
<td>This study provided evidence that a food manager training and certification program may be an effective way to improve the inspection scores of restaurants. There are concerns regarding the improvement in the mandatory group’s scores as a “perceived threat of closure” and a loss of three restaurants due to closure may have enhanced the results.</td>
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<tr>
<td></td>
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<td>Target: Restaurant managers (adults)</td>
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<td></td>
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<td>Intervenor: Can’t tell</td>
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<tr>
<td></td>
<td></td>
<td>Setting: Multiple training sites</td>
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<td>Agency: Boston Inspection Services Department and Boston Health Department.</td>
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<td></td>
<td></td>
<td>Description: A food manager training and certification program was made mandatory for managers of a) restaurants with licenses suspended due to inspection conditions and b) restaurants linked epidemiologically to cases of foodborne illness. Participation was also available on a voluntary basis. The 15 hours of training covered contamination and foodborne illness, sanitary facilities, pest control, employee training, and safe food service facilities among other topics. Courses were offered at multiple sites. One manager from each restaurant participated. Managers were certified after completing the course and receiving a score of 75 or higher on a standardized written examination.</td>
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<td>Evaluation: Routine inspection records (1989 through 1992) were analyzed pre, post 1 (one year) and post 2 (two years) training for three groups: a mandatory group of 26 restaurants (managers’ attendance was mandated); a voluntary group of 36 restaurants (managers attended voluntarily) and a control group of 40 restaurants (no staff attendance).</td>
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<tr>
<td>Study (Country)</td>
<td>Design (Quality assessment)</td>
<td>Intervention</td>
<td>Outcome</td>
<td>Comments</td>
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</table>
| Rinke et al., 1975 (United States) | RCT (moderate) | *Intervention*: Food handler training/certification  
*Target*: Food handlers employed in university residence halls (adults)  
*Intervenor*: Instructor  
*Setting*: Classroom  
*Agency*: Institution Management and Home Economics Education Departments, Iowa State University  
*Description*: Two food safety training methods: live instruction and taped instruction. Both methods used 35 mm slides. The live method included a commentary and questions presented by an instructor with opportunity for participants to respond to questions. The tape version included the same commentary and questions, but these were presented as a synchronized slide-tape program requiring no instructor to be present. The training program aimed to give participants better understanding of the characteristics of bacteria, apply methods to control bacteria and develop concepts of sanitation. The slide program with commentary was developed by the Iowa Dietetic Association in cooperation with Economics Laboratory, Inc. Slides concerned with overall basic sanitation concepts were selected.  
*Evaluation*: Participants were randomly allocated to two groups, each received a different education program on food safety. Both groups were given the same audiovisual show, however, one group had the opportunity to respond to questions by a live presenter. Both groups were tested for their knowledge before and after the intervention by a written test consisting of four sections and 53 test items. | Significant improvements in knowledge were found with both groups ($p = .01$). No significant difference in post-test scores between groups. | This study provides evidence that these two educational programs improve knowledge. The study is limited due to potential contamination that may weaken the comparisons between them. Both groups were from the same premises. |
<table>
<thead>
<tr>
<th>Study (Country)</th>
<th>Design (Quality assessment)</th>
<th>Intervention</th>
<th>Outcome</th>
<th>Comments</th>
</tr>
</thead>
</table>
| Waddell & Rinke, 1985 (United States) | RCT (moderate) | *Intervention:* Foodhandler training/certification  
*Target:* Hospital food service employees (adults)  
*Intervenor:* Computer system/lecturer (dietician on hospital staff)  
*Setting:* Classroom  
*Agency:* University of Maryland and Walter Reed Army Medical Hospital  
*Description:* Computer-assisted instruction (CAI) sanitation training program, based on a synchronized slide-tape sanitation program developed by Rinke, and a warm-up program were designed and written by the investigators. The sanitation program was composed of five lessons and two review sessions and consisted of basic principles of sanitation relevant to all food handlers. Topics addressed included characteristics of bacteria, elements required for growth, techniques for controlling bacteria, and personal hygiene. The lecture method of instruction (LMI) presentation used a prepared script and supporting slides. Questions were limited to those that would support the instruction.  
*Evaluation:* A randomized control group using a pre/post-test design extended to two levels of treatment variables, CAI and LMI. CAI (n = 29) LMI (n = 31) and Control (n = 27) groups completed both training and pre-post testing. A sanitation knowledge evaluation questionnaire was employed. | The CAI group and LMI group attained significantly higher scores than the control group (p < .05). The score gains did not differ significantly between the CAI and LMI groups. Significantly more training time was required by the CAI group than the LMI group (p < .001) | This study provides evidence that the CAI and LMI methods were equally effective for teaching sanitation for most of the employees who participated in the study. Application to the population at large is limited by selection bias resulting from the use of volunteers. |

Table 2: Summary of Interventions and Outcomes for Studies Rated 'Moderate' Methodologically
<table>
<thead>
<tr>
<th>Study (Country)</th>
<th>Design (Quality assessment)</th>
<th>Intervention</th>
<th>Outcome</th>
<th>Comments</th>
</tr>
</thead>
</table>
| Ehiri et al., 1997 (United Kingdom) | Cohort analytical (moderate) | **Intervention:** Food handler training/ certification  
**Target:** Food handlers (adults)  
**Intervenor:** Can’t tell  
**Setting:** Four training centres in Scotland  
**Agency:** Royal Environmental Health Institute of Scotland (REHIS)  
**Description:** The elementary food hygiene training scheme of the REHIS conducted at four centres in Scotland between October 1995 and March 1996.  
**Evaluation:** A Solomon 4 experimental design was used to evaluate the food hygiene training course. The design consisted of the intervention group (188 individuals – 94 pre-tested and 188 post-tested) and the comparison group (204 employees from a City Council in the same locality, 75 pre-tested and 204 post-tested). A structured self-completion questionnaire surveyed food hygiene knowledge, attitudes, and opinions before and after training. | No significant differences were found between the pre/post or intervention/control groups’ in the knowledge of a number of crucial aspects of food safety, including food storage, cross contamination, temperature control and high risk foods. However, the intervention group performed significantly better in a number of variables, both in pre and post-tests and in comparison with the control group. | This study provides evidence of the ineffectiveness of a food training/certification course in the overall food safety categories examined. The study is limited in its use of a self-completion questionnaire to determine practices. Intervention participants tended to have a high scores on the pre-test prior to training. |
| *Kirshner 1990 | RCT (moderate) | **Intervention:** Inspection and Food handler training/certification  
**Target:** Food handlers, owners and operators  
**Intervenor:** Public Health Inspectors  
**Setting:** Food service establishments  
**Agency:** Peel Health Department  
**Description:** Routine inspection according to Food establishments receiving onsite education sessions did not differ in number of infractions from food establishments that did not receive onsite education sessions. Food establishments receiving 2 or 4 inspections did not differ | These data suggest that a regimen of 2 inspections should be adopted for unlicensed premises and licensed premises where there is a system in place for evaluating trends. Where the system does not exist in licensed premises, 4 inspections should be adopted as the standard. |
<table>
<thead>
<tr>
<th>Study (Country)</th>
<th>Design (Quality assessment)</th>
<th>Intervention</th>
<th>Outcome</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>Regulation 243/84 of the Public Health Act (Ontario). Inspection frequencies were 2, 4 or 6 times a year (unwarned). On-site educational sessions with the intention of increasing compliance to regulatory standards. <strong>Evaluation:</strong> An index of infraction scores for food establishments based on 20 content areas outlined in the public health inspection guidelines and suspected food poisoning.</td>
<td>in number of infractions from the establishments that received 6 inspections. Licensed premises accounted for 6 of the 7 episodes of food poisoning.</td>
<td>There are concerns regarding the fact that “problem” establishments were excluded from the study.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| *Bader et al., 1978 (United States)* | RCT (moderate) | **Intervention:** Inspection  
**Target:** Food service establishment owners and operators (adults)  
**Intervenor:** Public Health Inspectors  
**Setting:** Food service establishments (schools, churches, restaurants and caterers)  
**Agency:** Seattle-King County Health Department, Washington.  
**Description:** Inspection frequency, four times per year versus inspection performed in response to public complaint.  
**Evaluation:** Food service establishments (mostly restaurants and some schools) were randomly assigned to be inspected either four times yearly or only to be inspected after a public compliant (study duration two years). All restaurants were inspected at the end of the study and the scores compared. | The inspection scores for premises that had been inspected four times per year were better than the other group (demerit point scores of 10.2 and 15.0 respectively; maximum score not reported but score less than 20 deemed acceptable). The statistical significance of these findings was not reported. | These data suggest that inspections done four times yearly result in marginally better inspection scores than is the case when inspections are done only in response to public complaint. There are concerns regarding the fact that “problem” establishments were excluded from the study. |
<table>
<thead>
<tr>
<th>Study (Country)</th>
<th>Design (Quality assessment)</th>
<th>Intervention</th>
<th>Outcome</th>
<th>Comments</th>
</tr>
</thead>
</table>
| *Corber et al., 1984 (Canada) | RCT (moderate) | Intervention: Inspection  
Target: Food premise supervisors and food handlers  
Intervenor: public health inspector  
Setting: Foodservice establishments  
Agency: Ottawa-Carleton Regional Health Unit  
Description: Eating establishments were stratified and randomly assigned to receive inspections 6, 9 or 12 times per year.  
Evaluation: The actual number of inspections was recorded. The inspection scores were compared. | Four hundred eating establishments were inspected. Analysis was conducted comparing final inspection score with first inspection score, by month of inspection and by order of inspection. The results of the analysis showed that frequency of inspection did not improve inspection scores from the first inspection to the final inspection, from month to month or by inspection order. | The evaluation is limited by the lack of outcome assessor blinding and a weak data collection tool. |

* from 1997 Review
APPENDICES

Appendix 1: Ontario Mandatory Health Programs and Services Guidelines (December 1997)
Appendix 2: Literature Review Committee – Contact Information
Appendix 3: Key Words for Search
Appendix 4: Relevance Tool
Appendix 5: Quality Assessment Tool
Appendix 6: Data Extraction Tool
Appendix 7: Description of the 2000 Food Safety Review Process
Appendix 8: Potentially Relevant Studies Not Retrieved in Time
Appendix 9: Component Ratings of All Studies Assessed for Methodological Quality
Appendix 10: Food Safety Interventions Assessed in Weak Evaluation Studies
Appendix 1: Ontario Mandatory Health Programs and Services Guidelines (December 1997)

Food Safety:

**Goal:**
To improve the health of the population by reducing the incidence of food-borne illness.

**Objectives:**
To ensure that food is stored, prepared, served and distributed in a manner consistent with public health practices.
To stop the sale or distribution of food that is unfit for human consumption by reason of disease, adulteration, impurity or other cause.

**Requirements and Standards:**
1. The Board of Health shall provide food safety information annually:
   - to the community, by displaying readily available printed educational material to visitors to Board of Health offices and by providing the information through the media;
   - to all non-profit community groups such as school nourishment programs, food banks, and community meal programs; and
   - to teachers responsible for teaching food-related subjects to students in grades 7 and 8 and/or other teachers as deemed appropriate.

Board of Health staff will assist if requested.

The Board of Health shall assess all food premises annually and shall determine their risk status (high, medium or low) according to the Ministry of Health Hazard Analysis Critical Control Point Protocol (January 1, 1998);

The Board of Health shall provide public health inspection of all food premises, to ensure compliance with Ontario Regulation 562 under the Health Protection and Promotion Act, according to the following schedule:

- not less than once every four months for high-risk food premises and in accordance with the Ministry of Health Hazard Analysis Critical Control Point Protocol (January 1, 1998);
- not less than once every six months for medium-risk food premises;
- not less than once every 12 months for low-risk food premises; and
- additional inspections as necessary to ensure:
  - correction of non-compliance with the Regulation,
  - investigation of foodborne illness and foodborne outbreaks,
  - investigation of consumer complaints, and
  - action on a food recall.

The Board of Health shall ensure that food handler training courses are provided in accordance with the Ministry of Health Food Handler Training Protocol (January 1, 1998) to food handlers in high and medium risk food premises.
The board of health shall undertake food recalls in accordance with the Ministry of Health *Food Recall Protocol (January 1, 1998)*.

In accordance with the provisions of the Health Protection and Promotion Act, the board of health shall provide to the Minister of Health semi-annual and annual food safety data. The January 1 to June 30 semi-annual food safety report shall be sent to the Minister of Health prior to July 31 of the reporting year. The January 1 to December 21 annual food safety report shall be sent to the Minister prior to January 31 of the year following the annual report period.

The board of health shall have a written protocol for responding to food-related complaints, based on a risk-assessment approach, and shall take appropriate action within 24 hours of notification of the food-related complaint.
Appendix 2: Literature Review Committee – Contact Information

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Valerie Mann

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Jane Ying

Quality Assessment Subgroup:
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Valerie Mann
Jane Ying

Data Extraction Subgroup:
Judy DeWolfe
Valerie Mann
## Appendix 3: Key Words for Search

### KEY WORDS USED IN COMPUTER SEARCH (ALSO USED IN RELEVANCE TESTING)

<table>
<thead>
<tr>
<th>Effectiveness</th>
<th>Public Health Interventions</th>
<th>Food Safety</th>
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<tbody>
<tr>
<td>Effective:</td>
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<td>Training</td>
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</table>

Note: Words may have been truncated in enhance search (e.g., Evaluat:)
Appendix 4: Relevance Tool

RELEVANCE TOOL:

Effectiveness of Public Health Interventions on Food Safety

Relevance Criteria:

1) The article describes a food safety intervention  Y  N

2) The article involves an intervention applicable to public health practice in Canada, consistent with Ontario’s Mandatory Health Programs and Services Guidelines.  Y  N

3) The intervention described could be implemented, facilitated or promoted by staff in local public health units in Canada.  Y  N

4) The article assesses the effectiveness of the intervention in relation to the outcomes of interest, such as shifts in knowledge, attitudes and practices.  Y  N

5) The study design contains outcome evaluation.  Y  N

Reviewer Decision:

Include in critical appraisal (only if answer “yes” to all 7 relevance criteria)  Y  N

If Discrepancy in Inclusion Decision: Reason for discrepancy:  Y  N

Difference in interpretation of criteria  Y  N

Differences in interpretation of study  Y  N

Additional Comments:

FINAL DECISION: INCLUDE IN STUDY  Y  N

If YES, search bibliography to identify other possible relevant articles to retrieve.
Appendix 5: QUALITY ASSESSMENT TOOL

COMPONENT RATINGS

A) SELECTION BIAS

(Q1) Are the individuals selected to participate in the study likely to be representative of the target population?
1 Very likely
2 Somewhat likely
3 Not likely
4 Can’t tell

(Q2) What percentage of selected individuals agreed to participate?
1 80 - 100% agreement
2 60 – 79% agreement
3 less than 60% agreement
4 Not applicable
5 Can’t tell

B) STUDY DESIGN

Indicate the study design
1 Randomized controlled trial
2 Controlled clinical trial
3 Cohort
4 Other specify __________

RATE THIS SECTION STRONG MODERATE WEAK
See dictionary 1 2 3

RATE THIS SECTION STRONG MODERATE WEAK
See dictionary 1 2 3
C) CONFounders

The following are examples of confounders:

1. Ethnicity
2. Sex
3. Marital status / family
4. Age
5. SES (income or class)
6. Education
7. Health status
8. Pre-intervention score on outcome measure (BMI, weight, VO2 Max, blood pressure, etc)

(1) Indicate the percentage of relevant confounders that were measured in the experimental and control groups prior to the intervention.

1. 80 – 100%
2. 60 – 79%
3. Less than 60%
4. Can’t Tell

(2) If there were important differences between groups prior to the intervention were they controlled for?

1. Yes
2. No
3. Can’t tell

D) BLINDING

(Q1) Was (were) the outcome assessor(s) aware of the intervention or exposure status of participants?

1. Yes
2. No
3. Can’t tell

(Q2) Were the study participants aware of the research question?

1. Yes
2. No
3. Can’t tell
E) DATA COLLECTION METHODS

(Q1) Were data collection tools shown to be valid?
1 Yes
2 No
3 Can’t tell

(Q2) Were data collection tools shown to be reliable?
1 Yes
2 No
3 Can’t tell

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<thead>
<tr>
<th>RATE THIS SECTION</th>
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<th>MODERATE</th>
<th>WEAK</th>
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<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

F) WITHDRAWALS AND DROP-OUTS

(Q1) Were withdrawals and drop-outs reported in terms of numbers and reasons per group?
1 Yes
2 No
3 Can’t tell

(Q2) Indicate the percentage of participants completing the study. (If the percentage differs by groups, record the lowest.)
1 80 -100 %
2 60 - 79 %
3 less than 60 %
4 Can’t tell

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<th>MODERATE</th>
<th>WEAK</th>
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<td>See dictionary</td>
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GLOBAL RATING

COMPONENT RATINGS

Please transcribe the information from the gray boxes on pages 2-4 onto this page.

A  SELECTION BIAS

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B  STUDY DESIGN

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C  CONFOUNDERS

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D  BLINDING

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E  DATA COLLECTION METHODS

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F  WITHDRAWALS AND DROPOUTS

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<td>3</td>
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GLOBAL RATING FOR THIS PAPER (circle one)

1  STRONG (four STRONG ratings with no WEAK ratings)
2  MODERATE (less than four STRONG ratings and one WEAK rating)
3  WEAK (two or more WEAK ratings)

WITH BOTH REVIEWERS DISCUSSING THE RATINGS:

Is there a discrepancy between the two reviewers with respect to the component (A-F) ratings?

No  Yes

If yes, indicate the reason for the discrepancy

1  Oversight
2  Differences in interpretation of criteria
3  Differences in interpretation of study

FINAL DECISION OF BOTH REVIEWERS (circle one):

1  STRONG
2  MODERATE
3  WEAK
Appendix 6: DATA EXTRACTION TOOL

PHRED Effective Public Health Practice Project

Ref ID #_________

Study Identification

<table>
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<th>First Author</th>
<th>_________</th>
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</thead>
<tbody>
<tr>
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<td>19____</td>
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<tr>
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<tr>
<td></td>
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<td>☐ Other language (specify)</td>
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<tr>
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<td>☐ Canada</td>
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<tr>
<td></td>
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</tr>
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<td>☐ United Kingdom</td>
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<tr>
<td></td>
<td>☐ Other (specify)</td>
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<tr>
<td></td>
<td>☐ Can’t tell</td>
</tr>
</tbody>
</table>

Design

| Years data collected | 19____ to 19____ | ☐ Can’t tell |
| Number of intervention groups | _________ | ☐ Can’t tell |
| Number of control groups | _________ | ☐ Can’t tell |
| Number of subjects screened | _________ | ☐ Can’t tell |
| Number of eligible subjects | _________ | ☐ Can’t tell |

Number of allocated subjects (total and by group)

| Total | _________ | ☐ Can’t tell |
| Intervention #1 | _________ | ☐ Can’t tell |
| Intervention #2 | _________ | ☐ Can’t tell |
| Intervention #3 | _________ | ☐ Can’t tell |
| Control | _________ | ☐ Can’t tell |

Number of drop-outs (total and by group)

| Total | _________ | ☐ Can’t tell |
| Intervention #1 | _________ | ☐ Can’t tell |
| Intervention #2 | _________ | ☐ Can’t tell |
| Intervention #3 | _________ | ☐ Can’t tell |
| Control | _________ | ☐ Can’t tell |

Source of funding for the study (check all that apply)

☐ Governmental organization
☐ Commercial organization
☐ Health-care provider organization
☐ Voluntary body (e.g. Health Promotion Organization)
☐ Charitable trust
☐ Research funding body (e.g. Medical Research Council)
☐ Other (specify) | ______________________ |
☐ Can’t Tell
Sample

Sex (Check one box only)  ☐ Male  ☐ Female  ☐ Mixed  ☐ Can’t tell
Age (specify mean and range)  mean_________upper_ __lower____  ☐ Can’t tell
Ethnicity (specify)  ______________________  ☐ Can’t tell
Education (Check one box only)
☐ Completed grade school
☐ Completed high school
☐ Completed university
☐ Mix
☐ Other _________________
☐ Can’t tell
Residential Setting (Check one box only)
☐ Urban  ☐ Mix
☐ Rural  ☐ Can’t Tell
Social-economic status (specify)  ______________________  ☐ Can’t Tell
(e.g. income, employment)

Intervention – Describe for each intervention as applicable:

<table>
<thead>
<tr>
<th>Intervention #1</th>
<th>Intervention #2</th>
<th>Intervention #3</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eg. Frail elders</td>
<td>personalized program</td>
<td>plus community development program</td>
<td>Eg. Visits by project community development program</td>
</tr>
<tr>
<td>Educational session (workshops)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School curriculum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Counseling (one to one)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer-based learning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audio-visual materials (eg. Videos)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (specify)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Intervention descriptors: (check all that apply)

| Community development | ☐ | ☐ | ☐ | ☐ |
| Community-based | ☐ | ☐ | ☐ | ☐ |
| Mass media | ☐ | ☐ | ☐ | ☐ |
| Distribution of printed educational materials (eg. Fact sheets, posters) | ☐ | ☐ | ☐ | ☐ |
| Educational session (workshops) | ☐ | ☐ | ☐ | ☐ |
| School curriculum | ☐ | ☐ | ☐ | ☐ |
| Counseling (one to one) | ☐ | ☐ | ☐ | ☐ |
| Computer-based learning | ☐ | ☐ | ☐ | ☐ |
| Audio-visual materials (eg. Videos) | ☐ | ☐ | ☐ | ☐ |
| Support group | ☐ | ☐ | ☐ | ☐ |
| Other (specify) | ☐ | ☐ | ☐ | ☐ |
### Theoretical framework: (check all that apply for each intervention and control)

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<tbody>
<tr>
<td>Trans theoretical</td>
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<tr>
<td>PRECEDE</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Intention and action</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>Health belief model</td>
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<tr>
<td>Social cognitive theory</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Diffusion of innovation</td>
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<td>☐</td>
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<td>☐</td>
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<tr>
<td>Social marketing theory</td>
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<td>☐</td>
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<tr>
<td>Can’t tell</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Other (specify)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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</tr>
</tbody>
</table>

### Intervention provider: (state who (or what) delivered the intervention. check all that apply)

<table>
<thead>
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<th>Intervention #2</th>
<th>Intervention #3</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional (state profession)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>Research worker (member of study team)</td>
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<td>☐</td>
<td>☐</td>
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</tr>
<tr>
<td>Para professional</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Lay person</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>Peer</td>
<td>☐</td>
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<td>☐</td>
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<tr>
<td>Volunteer</td>
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<td>☐</td>
<td>☐</td>
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</tr>
<tr>
<td>Computer system</td>
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<tr>
<td>Community groups</td>
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<td>☐</td>
</tr>
<tr>
<td>Can’t tell</td>
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<td>☐</td>
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<td>☐</td>
</tr>
<tr>
<td>Other (specify)</td>
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### Internal training provided:

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<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>No</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Can’t tell</td>
<td>☐</td>
<td>☐</td>
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</table>

### Intervention setting: (check all that apply)

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<tbody>
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<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Home</td>
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<td>☐</td>
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<tr>
<td>School</td>
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<td>Telephone</td>
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<td>Worksite</td>
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<tr>
<td>Clinic</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>Can’t Tell</td>
<td>☐</td>
<td>☐</td>
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### Intervention target group: (check all that apply)

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<td>Grade School</td>
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<tr>
<td>Adolescents</td>
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<td>Pregnant women</td>
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<tr>
<td>Parents</td>
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<td>❑</td>
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### Target group size: (check all that apply)

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<tbody>
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<tr>
<td>Family</td>
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<tr>
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<td>❑</td>
<td>❑</td>
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</tbody>
</table>

### Consumer involvement: Were consumers (i.e. members of the public) involved at any point of the design, conduct or interpretation of the study? (e.g., consumers involved in guideline development, or their views collected)

<table>
<thead>
<tr>
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<th>Intervention #2</th>
<th>Intervention #3</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>❑</td>
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<tr>
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<td>❑</td>
<td>❑</td>
<td>❑</td>
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<tr>
<td>Can’t Tell</td>
<td>❑</td>
<td>❑</td>
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</table>

### Intervention duration: Specify in weeks

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<th>Intervention #3</th>
<th>Control</th>
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</thead>
<tbody>
<tr>
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<td>❑</td>
<td>❑</td>
<td>❑</td>
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</table>

### Intervention frequency: Specify in weeks

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<th>Intervention #3</th>
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<tbody>
<tr>
<td>Can’t tell</td>
<td>❑</td>
<td>❑</td>
<td>❑</td>
<td>❑</td>
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</tbody>
</table>

### Length of post intervention follow-up period (all data collection points):

<table>
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<tr>
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<th>Intervention #1</th>
<th>Intervention #2</th>
<th>Intervention #3</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can’t tell</td>
<td>❑</td>
<td>❑</td>
<td>❑</td>
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</tbody>
</table>

************

Notes:
Appendix 7: Description of the 2000 Food Safety Review Process

2000 Food Safety Review

2000
Literature search

Potentially relevant articles captured
n=98

Articles retrieved
n=78

Articles passing relevance testing
n=24

1997
Food Safety Review

Potentially relevant articles
n=34

Relevant articles
n=31

2000 Quality Assessment

Moderate
n=7

Weak
n=48
Appendix 8: Potentially Relevant Studies Not Retrieved in Time

Expansion of the Massachusetts model for food safety education of high risk groups [kit] (1996). University. No location found

Food Safety Seminars - Spring 1996 Observations/Evaluations (memo.) (1996). In File after deadline


Luyt S A (1992). A study to assess the changes in hygiene of food premises following a specific health education programme. MSc School of Life Sciences, Cape Technikon, South Africa. No location found


Phillips A L (1986). Food Hygiene Health Education in Wyre Borough. University of Salford Civil Engineering Department. No location found
Rennie D (1993). Food Hygiene Education: a critical review of the IEHO Advanced Food Hygiene Course. MSc  University of Manchester UK. No location found


Wisdom M (1992). A Basic Food Hygiene Certificate - is it effective food hygiene training. Health Education Project, Guildford College UK. No location found
### Appendix 9: Component Ratings of All Studies Assessed for Methodological Quality

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Global Rating</th>
<th>Selection Bias</th>
<th>Study Design</th>
<th>Confounders</th>
<th>Blinding</th>
<th>Data Collection</th>
<th>Withdrawals</th>
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</thead>
<tbody>
<tr>
<td>Bader et al.*</td>
<td>1978</td>
<td>Moderate</td>
<td>Strong</td>
<td>Strong</td>
<td>Strong</td>
<td>Weak</td>
<td>Moderate</td>
<td>Strong</td>
</tr>
<tr>
<td>Corber et al.*</td>
<td>1984</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Strong</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Strong</td>
<td>Strong</td>
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<tr>
<td>Cotterchio et al.</td>
<td>1998</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Weak</td>
<td>Strong</td>
<td>Strong</td>
<td>Strong</td>
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<tr>
<td>Ehiri et al.</td>
<td>1997</td>
<td>Moderate</td>
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* from 1997 review
Appendix 10 – Food Safety Interventions Assessed in Weak Evaluation Studies


DESCRIPTION OF INTERVENTION

Goal: To improve food handling knowledge and practices of Kansas citizens by training/certifying Kansas Extension agents and sanitarians in food safety.

Strategy: Community-based education

Description: The SERVSAFE course from the Educational Foundation of the National Restaurant Association (NRA, 1992) served as the basis for the training information and certification of the Kansas Extension agents and sanitarians. Instruction tools such as slides, videos, and instructor’s guide were purchased and adapted for use specifically with Extension agents. Updated times and temperatures [1993 Food and Drug Administration Food Code (DHHS 1993)] and extended HACCP explanations and exercises were added. The Kansas Extension agents and sanitarians then implemented food safety training on a local level, reaching at least 3,500 Kansans.

Setting: Not described

Target: Citizens of Kansas

Agency: USDA-ES

Intervenor: Kansas Extension agents and sanitarians

EVALUATION

Design: Cross-sectional

Description: In the study, a questionnaire was mailed to certified extension agents. The questionnaire asked if food safety training had been conducted, who were the target groups, what types of creative training had been conducted, what were the numbers involved, and what were the behavioural changes resulting from the training. Behavioural changes including better handwashing and food handling practices (thawing and cooling of foods, taking internal temperatures of cooked foods).

COMMENTS

The evaluation is limited by the lack of reporting on how local participants were selected, their characteristics, withdrawals and drop-outs. In addition, no information was provided on the program delivery or data collection tools. A variety of training interventions was used to deliver food safety training to participants.
DESCRIPTION OF INTERVENTION - 1997

Goal: To use a risk assessment technique to improve or maintain operational quality of inspected foodservice establishments.

Strategy: Inspection

Description: Inspection frequency for foodservice establishments was determined by a risk assessment technique developed by F. Bryan (1982). A numerical risk is calculated by quantifying three key characteristics of foodservice operations: food property, food operations and average daily patronage. A risk coefficient was calculated for each characteristic. Inspections were made routinely with no prior warning given beforehand. After a period of one year, inspection report scores of the establishments were compared to determine if operational quality had improved, declined or remained constant. This method allows the identification of the establishments with the greatest potential risk and allows health departments to strategically allocate personnel to these operations.

Food property risk was designed to measure a food’s probability of being a vehicle in the transmission of foodborne disease. Every food item served is given a value of 1 to 5, with 5 being the highest incriminating value. Information about the food’s intrinsic qualities was also gathered.

The food operations risk was modified from Bryan’s design. In this study, this risk was established by calculating the mean of the five inspection report scores prior to February 1984. The inspection report scores were used as an index to represent an establishment’s history of operational sanitation. The scores were derived from the standard “State of Texas Foodservice Establishment Inspection Report” which operates on a demerit point system, based on a total achievable score of 100.

The average daily patronage was estimated from the number of patrons eating at the establishment. Again, a 1-5 range of risk values was used (1 = 1-75 customers/day, 2 = 76-150, 3 = 151 – 275, 4 = 276-400, 5 = 401 or above).

Setting: All foodservice establishments

Target: Foodservice establishment owner/operator

Agency: Hunt County Health Department, Texas, U.S.A.

Intervenor: Public health inspectors

EVALUATION

Design: Cohort

Description: In this study, restaurants in a district were grouped together into four different risk ratings and inspected on frequencies as designated for their risk rating. For each group, comparisons were made between the scores before the study started versus during the year of the study to determine if a significant proportion of premises had changed risk designation.

COMMENTS

The evaluation is limited by confounders, weak blinding and a weak data collection tool.
DESCRIPTION OF INTERVENTION - 1997

Goal: To present food safety information, in particular safe food temperatures, to food handlers.

Strategy: Food handler training/certification

Description: Two-hour food safety presentations were conducted in Barrie and South Simcoe. The presentations emphasized topics of time/temperature relationships. A thermometer learning activity was used. Participants were then asked to place various food related items on the thermometer, and the rest of their audience had the opportunity to move things up or down the scale. A consensus had to be reached on the “correct” temperature. More details describing the content and delivery of the presentations was not provided.

Setting: Not described

Target: Foodservice establishment owners and food handlers

Agency: Simcoe County District Health Unit

Intervenor: Resource Service staff member

EVALUATION

Design: Cohort one group pre + post (before and after)

Description: In this study, the pre- and post-test on knowledge were applied to groups of participants rather than individuals.

COMMENTS

Minor concerns regarding comparability of intervention and comparison groups. Major concerns about reproducibility of the intervention and the soundness of the outcome assessment.

DESCRIPTION OF INTERVENTION - 1997

Goal: To maintain food service operations in a safe and sanitary manner. To enable the food service industry to carry on a self-inspection program officially recognized by the U.S. Public Service.

Strategy: Inspection, Food handler training/certification

Description: A model program in food protection was launched in 1972: the Ohio Food Service Management Certification Program. The success of the certification course, not the entire certification program, was evaluated. Little information on the course was given.

Setting: All food service establishments

Target: Food service establishment owner/operator/manager

Agency: Ohio Health Department

Intervenor: Not described

EVALUATION

Design: Cohort (analytical two groups pre + post)

Description: In this study, the pre- and post-intervention inspection scores of non-randomly assigned intervention and control groups were compared.

COMMENTS

Major concerns regarding comparability of intervention and comparison groups and minor concerns about reproducibility of the intervention and the soundness of the outcome assessment.

DESCRIPTION OF INTERVENTION - 1997

Goal: To improve restaurant sanitation through foodservice management education.

Strategy: Food handler training/certification

Description: The National Institute for the Foodservice Industry (NIDI) foodservice sanitation course for managers was presented over a five week period, consisting of three sessions of approximately five hours each. (NIDI course not described in detail.) A NIDI manual was included and six homework assignments were mailed back to the instructor for comment and return. The final session included a written examination.

Setting: Foodservice establishments

Target: Foodservice managers

Agency: Jackson County Health Department, Illinois, U.S.A.

Intervenor: Foodservice educator from the Chicago and Illinois Restaurant Association

EVALUATION

Design: Cohort one group pre + post (before and after)

Description: In this study, the restaurant mangers receiving the educational program were matched on the basis of past inspection scores with restaurants whose managers did not received the intervention. Inspections were completed before and after the training session to assess the effectiveness of the NIDI course in reducing inspection violations.

COMMENTS

The evaluation is limited by the lack of reporting on the characteristics of the establishments and no detail regarding assignments of people to experiment and control. No information was provided regarding withdrawals and drop-outs and the outcome assessors were not blinded to the intervention status of the establishment.

DESCRIPTION OF INTERVENTION - 1997

Goal: To provide a course on safe food handling.

Strategy: Food handler training/certification

Description: Food handling courses offered by the Public Health Inspectors in Saskatchewan. Descriptive detailing of the course is not provided.

Setting: Not described

Target: Food handlers

Agency: Saskatchewan Health, National Sanitation Program, City of Saskatoon, Food Safe Program, City of Regina

Intervenor: Public Health Inspectors

EVALUATION

Design: Cohort one group pre + post (before and after)

Description: In this study, a pre- and post-test evaluation was performed. Knowledge (e.g., temperature control, personal hygiene, cross-contamination control), attitude and behaviours of participants were examined and compared.

COMMENTS

Minor concerns regarding comparability of intervention and comparison groups, and major concerns about the reproducibility of the intervention and the soundness of the outcome assessment.

DESCRIPTION OF INTERVENTION

Goal: To present food safety principles to food handlers.

Strategy: Food handler training/certification

Description: The typical lecture method of teaching food safety principles was compared to a computer-assisted interactive method. Basic food safety and HACCP information were chosen to coincide with nationally recognized food safety codes and procedures. Nine different modules included the importance of food safety, employee hygiene and handwashing, receiving, storage, thawing of foods, cross contamination, cooking and hot holding, cooling and sanitation. The CD-ROM software was narrated but within each module, the participant was asked questions about the materials just presented or instructed to use the computer mouse to indicate correct procedures.

The lecture format was developed directly from the script for the computer interactive software and included the use of a workbook. The lectures included specific examples from the participant’s work environment. The workbook used several of the same pictures visualized in the computer-assisted version of the information.

Setting: Work site

Target: Local quick service restaurant chain employees

Agency: University of Florida, Florida Restaurant Association

Intervenor: Written by food safety expert/Lecture scripted from software information

EVALUATION

Design: Randomized controlled trial

Description: In this study, a pilot-tested survey questionnaire consisting of 25 multiple choice questions assessed food safety knowledge before, immediately after and one week after the intervention for the lecture and computer-trained groups. The control group completed the pre- and post-test only. Effectiveness was determined by comparison of scores.

COMMENTS

The evaluation is limited by the information reported on the characteristics of the participants. No information was provided regarding the blinding status of the outcome assessor or participant withdrawals and drop-outs.
DESCRIPTION OF INTERVENTION

Goal: To improve the level of food service sanitation.

Strategy: Inspection

Description: The variable inspection technique recognized different levels of sanitation. Four classification levels were used: excellent (0-20pts); satisfactory (21-30pts); marginal (31-40pts); and, unsatisfactory (41+pts). Establishments with marginal or inadequate sanitation were visited four times more often than those with a history of excellent or satisfactory conditions. Recorded data cards summarized the most recent inspection, noted specific problems and repeated violations, indicated the average demerit score, and reflected the operating level of the establishment. Also recorded were the point scores of the last nine inspections, the average demerit score of the last nine inspections and the establishment classification level. In addition, Certificates of Excellence were issued to establishments that maintained prescribed sanitation levels within respective levels.

Setting: Food service establishments

Target: Foodservice establishment owners/operators

Agency: Arlington Environmental Health Bureau

Intervenor: Public health inspectors

EVALUATION

Design: Time series

Description: In this study, a master list of all establishment classifications was kept and reviewed and updated each quarter. This information was used to determine the percent of establishments operating in each of the four classification levels. The general trend in sanitation was then determined. A comparison of pre-intervention demerit scores to post-intervention demerit scores provided a picture of the change in classification levels.

COMMENTS

The evaluation is limited by the lack of reporting on the characteristics of the establishments. No information was provided regarding withdrawals and drop-outs of the establishments. The outcome assessors were not blinded to the intervention status of the establishment.

DESCRIPTION OF INTERVENTION - 1997

Goal:  
To provide food handling education as a prerequisite for the registration as a food handler in Trinidad and Tobago

Strategy:  
Food handler training/certification

Description:  
In Trinidad and Tobago, food handlers must be registered and issued a “food badge” annually under the Safe Foodstuffs By-law. A food handling education program forms a part of this registration process. In addition, food handlers must be certified by a medical practitioner before issuing the badge. The badge is given through paid application to the County Medical Officer of Health Office. Participants in the food education program at St. George Central were separated according to the type of food industry in which they were engaged. The lectures were then targeted to the various groups: itinerant vendor, dry goods handlers, food outlet workers, and food establishment employees.

Setting:  
Not described

Target:  
Food handlers

Agency:  
County Medical Officer of Health Office, Trinidad and Tobago

Intervenor:  
Public health inspector

EVALUATION

Design:  
Cohort one group pre + post (before and after)

Description:  
In this study, persons attending food safety lectures for food handlers were tested for their knowledge before and after the intervention. A comparison group was given the post-test only as a means of determining the degree to which the pre-test affects the post-test results. The increase in knowledge following training, the increase in knowledge over time, and the difference in knowledge due to educational level, age and sex.

COMMENTS

Food handlers were not randomly assigned to the two groups and were shown to be substantially different at baseline.

DESCRIPTION OF INTERVENTION - 1997

Goal: To use a process-oriented approach to improve the educational aspect of food service establishment inspections.

Strategy: Inspection

Description: Premises selected on the basis of the Ministry of Health and Long Term Care criteria for high risk facilities participated in a pilot project which implement and evaluated the use of the HACCP approach to performing food premise inspections. HACCP information and program plans were mailed out to the food premise managers prior to the inspections. Inspections were performed with the development of product/process flow charts, for hot and cold foods respectively. Regulation infractions were recorded, and the critical control points where proper food handling techniques had not been used were highlighted. A risk factor was recorded, and the written report on standard inspection forms was discussed with food premise personnel. Reinspections and monitoring were performed within the time frame of the pilot study. Risk assessment criteria were based on weightings from epidemiological associations between food handling and foodborne illness developed by the Center for Disease Control U.S.A. (CDC).

Setting: High risk food premises

Target: Food premise operators and owners

Agency: Region of York Health Unit, Ontario, Canada

Intervenor: Public health inspector

EVALUATION

Design: Cohort one group pre + post (before and after)

Description: In this study, a pre-test of knowledge, beliefs and behaviours in food handling safety was administered to the participants, a series of three HACCP interventions were implemented, and a post-test was completed.

COMMENTS

Major concerns regarding comparability of intervention and comparison groups, reproducibility of the intervention and the soundness of the outcome assessment.
DESCRIPTION OF INTERVENTION

Goal: To alter food establishment operator’s incentives, provide more information to consumers and require training in food safety techniques for food handlers.

Strategy: Food handler training/certification, Inspection, Community-based education

Description: 17-point action plan

Inspection/grading criteria in the food safety ordinance were revised to improve objectivity and reliability of scores. Clear suspension and revocation standards were established. Letter grades assigned based on aggregate score (A=90-100, B=80-89, C=70-79) were prominently posted. Scores below 70 were posted as numerical scores only. Most recent file inspection report was available for public review. Inspection scores accessible on DHS public web site, and a new search engine facilitated rapid access to specific restaurant scores. Also, a 24-hour consumer hotline for complaints was made available to the public.

Food safety training program required for managers and workers. At least one individual who has successfully completed the four hour training program is required to be present when establishment is open to the public.

Setting: Food establishments/Not described for training

Target: Food establishment owners/operators/employees and general public.

Agency: Los Angeles Department of Health Services

Intervenor: Los Angeles Department of Health Services

EVALUATION

Design: Cohort one group pre + post (before and after)

Description: In this study, changes in food establishment inspection scores, change in letter grades and number of violations were compared pre and three months post after the institution of the mandatory posting of the letter grades.

COMMENTS

The evaluation is limited by the lack of reporting on the characteristics of the establishments. No information was provided regarding withdrawals and drop-outs of the establishments.

DESCRIPTION OF INTERVENTION

Goal: To alter food establishment operator’s incentives, provide more information to consumers and require training in food safety techniques for food handlers.

Strategy: Food handler training, Inspection, Community-based education

Description: Second year of the 17-point action plan (See previous page).

Inspection, grading criteria in food safety ordinance were revised to improve objectivity and reliability of scores. Clear suspension and revocation standards established. Letter grades assigned based on aggregate score (A=90-100, B=80-89, C=70-79) must be prominently posted. Scores below 70 are posted as numerical scores only. Most recent file inspection report must be available for public review at food establishment. Inspection scores accessible on DHS public web site, and a new search engine facilitates rapid access to specific restaurant scores. 24-hour consumer hotline for complaints.

Food safety training program required for managers and workers. At least one individual who has successfully completed the four hour training program was required to be present when the establishment was open to the public.

Change in the second year:

Retail establishments were divided into risk categories, with higher risk categories receiving more frequent inspection. Unannounced independent verification inspections via the Ombudsman’s Office within one day of the routine inspection.

An external hotline established under the control of the Los Angeles County Auditor-Controller to hear complaints of owners and operators of retail food establishments.

DHS required that certified food handlers complete, every three years, an eight-hour, DHS-approved course on safe practices in food preparation and service.

Setting: Food establishments/Not described for training

Target: Food establishment owners/operators/employees and general public.

Agency: Los Angeles Department of Health Services

Intervenor: Los Angeles Department of Health Services

EVALUATION

Design: Cohort - one group pre + post (before and after)

Description: In this study, changes in food establishment inspection scores, change in letter grades and risk categories, number of violations closures, and foodborne illness complaint inspections for 1998 were compared to those for 1999.

COMMENTS

The evaluation is limited by the lack of reporting on the characteristics of the establishments. No information was provided regarding withdrawals and drop-outs of the establishments.

DESCRIPTION OF INTERVENTION

Goal: To increase food safety and sanitation knowledge and behaviour of school foodservice employees.

Strategy: Food handler training/certification

Description: The training curriculum consisted of a two day, 15 hour workshop and was adapted from the NRA ServSafe program entitled Recipes for Safety. Curriculum activities included crossword puzzles, case studies specific to school foodservice situations and references to actual food-related illnesses. The ServSafe video series which incorporate basic food safety; curriculum activities included crossword puzzles, case studies specific to school foodservice situations and references to actual food-related illnesses. Personal hygiene; HACCP; receiving, storage and preparation; cooking and service; and cleaning and sanitising were also part of the curriculum.

Setting: Nine schools including elementary, middle and high school levels.

Target: School foodservice staff

Agency: Department of Nutrition and Foodservice Systems at the University of North Carolina

Intervenor: NRA ServSafe training certified researchers with food production experience.

EVALUATION

Design: Time series

Description: In this study, food safety training was assessed by focussing on two key areas of food safety and sanitation management: the change of employee knowledge following the two day training session and the longer term behaviour changes following the training session. A pre-training evaluation was designed to assess the existing food safety knowledge and behaviours of the district foodservice employees. A post-training evaluation re-assessed the knowledge immediately following training. The post-training behaviours were assessed two months after training.

Food safety and sanitation criteria were assessed in three main areas: the place (sanitation of the foodservice facility and equipment); the product (from food handling procedures to service); and the person (personal hygiene and safety).

Person - 12 food safety behaviours including: hand washing after certain practices; avoidance of hand contact with eating surfaces; using hair restraints; availability of soap in restrooms; storage and lifting practices; and, burn hygiene.

Product - 14 safe food handling and production behaviours including: food washing; temperature assessment; thawing; cooling and storage practices; and, maintenance of logs.

Place - 21 kitchen areas including: area; pot; oven; hood and utensil sanitation and maintenance; serving line temperature logs; and, pest control.

COMMENTS

The evaluation is limited by the lack of reporting on blinding, data collection and withdrawals and drop-outs components. Composition of school nutrition staff not described.

**DESCRIPTION OF INTERVENTION**

**Goal:** To educate beef demonstrators about food safety issues and food safety behaviours.

**Strategy:** Food handler training/certification

**Description:** Food safety education was accomplished using the NRA ServSafe, an eight hour program using lecture, slides and videos to address proper storage of food, sanitation, contamination and its prevention, and principles of Hazard Analysis/Critical Control Points (HACCP).

**Setting:** Not described

**Target:** Beef demonstrators, American National Cattle Women, Inc.

**Agency:** American National Cattle Women, Inc.

**Intervenor:** Not described

**EVALUATION**

**Design:** Cohort - one group pre + post (before & after)

**Description:** In this study, food safety training was assessed by three instruments examining knowledge, confidence levels/attitudes, and behaviours related to beef safety, food safety in general, beef production issues and beef demonstration. A pre-training question consisting of 17 questions on participants’ confidence levels/attitudes regarding safe food handling and beef safety and 19 questions regarding food safety behaviours at home and when demonstrating beef was mailed to pre-registered individuals. Post-training and follow-up questions were in a packet at training registration. Post-training questions consisting of the same questions on confidence levels/attitudes, eight knowledge questions plus 19 questions regarding food safety behaviours at home were returned before departing from the training site. Participants completed the follow-up questions, duplicates of the questions on food safety behaviours, after they had conducted at least one beef demonstration. As well, the participants’ food safety knowledge was assessed by the ServSafe certification exam.

**COMMENTS**

The evaluation is limited by the self-selected and unusually motivated participants and lack of reporting on withdrawals and drop-outs components.

DESCRIPTION OF INTERVENTION

Goal: To train foodservice owners, operators and managers in the methods of foodborne illness prevention.

Strategy: Food safety training/certification

Description: The program consisted of eight hour courses on foodborne disease prevention in foodservice establishments. The course prepared the manager/operator with a specific ability to conduct an operations hazard analysis, determine critical control points and specific quality assurance policies for the microbiology, physical, and chemical hazards in his/her operation. The quality assurance policies were specified by the student in the form of a Quality Assurance (QA) program. This is a policy document having sections on personnel QA duties, recipe QA procedures, training QA, cleaning and sanitizing QA and self inspection. It was tailored by the manager/operator to fit the individual physical facility, menu, organization and personnel characteristics of each foodservice establishment. The student must pass a test with a score of not less than 75%, and then return to his/her foodservice operation and write the QA program. This was then submitted and when approved, the student was awarded the graduation certificate. The courses were conducted every four months throughout the state.

Setting: Not described

Target: Foodservice managers/operators

Agency: Minnesota Restaurant Association, Minnesota Department of Health, University of Minnesota Agricultural Extension Service and Department of Food Science and Nutrition

Intervenor: A group of 20 qualified sanitarians and foodservice personnel.

EVALUATION

Design: Cohort – one group pre + post (before and after)

Description: In this study, the evaluation consisted primarily of a comparison of scores on the students' pre- and post-test (nine months), and an evaluation of the student prepared instructor course rating sheets.

COMMENTS

The evaluation is limited by the selection of the participants and lack of reporting on their characteristics. No information was provided regarding data collection tools and participants' withdrawals and drop-outs.

DESCRIPTION OF INTERVENTION

Goal: To improve food protection practices in foodservice establishments.

Strategy: Food handler training/certification

Description: Certification was mandatory for all foodservice operators/managers. A University of Minnesota Foodservice Quality Assurance Program 16 hour course on prevention of foodborne illness for operator/managers was used to certify the foodservice operators/managers.

Setting: University of Minnesota

Target: Foodservice operators/managers

Agency: University of Minnesota Foodservice Quality Assurance Program

Intervenor: Local state sanitarian

EVALUATION

Design: Cross-sectional survey

Description: In this study, a form served as a guideline to questioning and as a data collection tool. Each major section contained specific objectives to be scored, then totalled to arrive at an overall score that was correlated with the sanitarian’s inspection score. The sanitarian’s inspection score was compiled from an average of at least two previous sanitation inspection visits. Knowledge and use of time and temperature controls for food from receiving to consumption were evaluated.

COMMENTS

The evaluation is limited by the weak evaluation design. No information was provided regarding data collection tools.
DESCRIPTION OF INTERVENTION

Goal: To achieve and maintain a high level of sanitation by food service establishments.

Strategy: Food handler training/certification

Description: Every person in charge of a restaurant/eating place determined to be a major violator of the Health Code (Schedule A violations) and who did not have a valid food sanitation certificate, as well as all applicants for restaurant/other eating place permits were required to take the food protection course. The 15 training hours were given in three hour sessions over a five day period. Minimum registration fee covered material costs. Course content placed emphasis on practical aspects of food sanitation, as well as on the nature of the regulations covering eating places in New York City and included: health code pertinent rules and regulations; personal hygiene requirements; fundamentals of food microbiology; foodborne disease and prevention; proper food handling and storage practices; cleaning and sanitizing procedures; rodent and insect control; maintenance and cleaning scheduling; and, self-inspection procedures. Lectures and discussions were main forms of presentation. Visual aids such as movies, slides, demonstrations, posters, charts and leaflets were used to reinforce the oral instruction. Course also given in languages other than English. Graduate received a Food Protection Certificate to display at food establishment.

Setting: Not described

Target: All food establishments

Agency: Environmental Health Services

Intervenor: Environmental Health Training Centre staff - sanitarians and other experts

EVALUATION

Design: Cohort – one group pre + post (before and after)

Description: In this study, numbers of restaurants/eating places involved in foodborne illness and Schedule A violations were compared before and after the intervention.

COMMENTS

The evaluation is limited by the lack of reporting on the characteristics of the establishments. No information was provided regarding withdrawals and drop-outs of the establishments. The outcome assessors were not blinded to the intervention status of the establishment.
DESCRIPTION OF INTERVENTION - 1997

Goal: To reduce food safety violations in restaurants

Strategy: Inspection

Description: A standard reporting form developed by the Seattle-King County Department of Public Health for all routine inspections was used. Data was entered into a computerized system. The data collection differs slightly from that of other scales and the US Food and Drug Administration in that greater weight was assigned to violations of proper temperature controls of potentially hazardous foods. Managers were also telephoned to collect additional risk factor data.

Setting: Permanent restaurants

Target: Restaurant owners and operators

Agency: Seattle-King County Department of Public Health, Washington, U.S.A.

Intervenor: Public health inspectors

EVALUATION

Design: Case-Control

Description: The “case” restaurants (associated with outbreaks) were matched with controls by health district and routine inspection data.

COMMENTS

The ‘case’ restaurants and the control restaurants were matched by health district and routine inspection data only. Concerns about potential confounders not being addressed.

DESCRIPTION OF INTERVENTION - 1997

Goal: To assist food service managers to apply food safety principles in the long-term maintenance of a high level of sanitation.

Strategy: Food handler training/certification, Inspection

Description: Premises were inspected before the training program. Managers then participated in a food safety training program which covered aspects of food storage, contamination, sanitation, storage of hazardous materials, personal hygiene, and proper housekeeping practices.

Setting: Franchise restaurants (under a single corporation)

Target: Food service managers

Agency: International Association of Milk, Food, and Environmental Sanititians (U.S.A.)

Intervenor: Public health educators and inspectors

EVALUATION

Design: Cohort one group pre + post (before and after)

Description: In this study, inspection scores were performed using standardized inspection technique before and after managers received food safety training. Post-training inspection surveys performed three months and one year later.

COMMENTS

Major concerns regarding comparability of intervention and comparison groups and minor concerns about reproducibility of the intervention and the soundness of the outcome assessment.

DESCRIPTION OF INTERVENTION

Goal: To improve food handler behaviour.

Strategy: Food handler training/certification

Description: The nationally (and internationally) recognized Institution of Environmental Health Officers Certification in Basic Food Hygiene course. Typically six hours in duration. Curriculum not described.

Setting: Not described

Target: Food handlers

Agency: Institute of Environmental Health Officers, University of Birmingham, U.K.

Intervenor: Not described

EVALUATION

Design: Cohort (analytical two groups pre + post)

Description: In this study, a sample of food premises were assessed before and after the staff had completed the IEHO Basic Certification in Food Hygiene and compared to a control group whose staff had not received training. The assessment procedure used a food hygiene audit designed to identify changes in behaviour as a result of improvements in knowledge from the course.

COMMENTS

The evaluation is limited by the differences in characteristics between the groups of premises. No information was provided regarding data collection tools. Blinding of outcome assessors was not described.

DESCRIPTION OF INTERVENTION - 1997

Goal: To use certification as a tool for improving sanitation.

Strategy: Food handler training/certification

Description: Mandatory certification in food service sanitation with 15 contact hours of classroom training and the passing of a state examination.

Setting: Class A and Class B food service establishments (U.S.A.)

Target: Food service managers

Agency: McLean County Health Department, Illinois (U.S.A.)

Intervenor: Public health inspectors

EVALUATION

Design: Cohort one group pre + post (before and after)

Description: In this study, initial inspection scores were completed as routine unannounced inspections as required under food service regulations in the U.S.A. A standard 44-item inspection form was used and critical violations were weighted. Violations were categorized as being Procedural, Structural, and Procedural/Structural. Certificates were issued accordingly, and the premises were re-inspected up to three years post-certification. Inspection records three years prior to and after certification were analyzed for trends. Inspection scores determined by a standard 44-item inspection form.

COMMENTS

The evaluation is limited by the selection bias, lack of reporting on the characteristics of the establishments. No information was provided regarding withdrawals and drop-outs of the establishments. The outcome assessors were not blinded to the intervention status of the establishment. Weak on data collection tool validity and reliability.

DESCRIPTION OF INTERVENTION - 1997

Goal: To maximize food safety for airline crew and passengers and also improve the quality of food.

Strategy: Food handler training/certification

Description: The HACCP approach was used to ensure the prevention of foodborne diseases in airline food. The key components of HACCP were the identification and assessment of the Critical Control Points (CCPs) necessary to assure a safe product and their management.

Setting: Associated flight catering establishment on a Greek island

Target: Catering establishment management and staff

Agency: Bacteriological Department, Athens School of Hygiene

Intervenor: Not described

EVALUATION

Design: Cohort one group pre + post (before and after)

Description: In this study, comparisons in bacteriological pathogen counts were made between bacteriological pathogen counts in food samples taken before an airline company implemented procedural changes based on HACCP versus samples taken after procedural changes had been made.

COMMENTS

Major concerns regarding reproducibility of the intervention and minor concerns about comparability of intervention and comparison groups and the soundness of the outcome assessment.
DESCRIPTION OF INTERVENTION - 1997

Goal: To ensure food safety by food handlers

Strategy: Food handler training/certification

Description: In the Hospitality and Tourism program described, food handler training was given in the second year of the program, prior to the practical kitchen experience which occurs in the third year of the four year program.

The food handler education program addresses the following concepts:

- Etiology of foodborne illnesses
- Proper food handling techniques
- Person hygiene and its importance in a food service setting
- Food premise regulations

Setting: Food service industry course in a Hospitality and Tourism program (post-secondary school)

Target: Potential food premise managers or supervisors

Agency: Not described

Intervenor: Not described

EVALUATION

Design: Cross-sectional study

Description: In this study, the relationship between educational level of students within a hospitality program and their knowledge scores on food safety was measured.

COMMENTS

No adjustments were made for potential confounding variables.

DESCRIPTION OF INTERVENTION

Goal: To provide effective food safety training.

Strategy: Food handler training/certification

Description: Mandatory general lecture on current health problems relevant to food industry after which the program content in print form was provided for further study. To facilitate and improve independent learning, trainees were invited to 1) listen to recorded lectures on food poisoning of bacterial and non-bacterial origin, 2) see full-length and short films on the main hygiene topics connected with given occupation, 3) see filmstrip “Eat and Be Healthy” and coloured slides and 4) study a booklet given to each newcomer and prepared in the form of questions and answers. Newcomers only start work after passing an examination and obtaining a certificate testifying that they have successfully assimilated the program content.

Every two years the training program was repeated at places of work, in the form of seminars followed by an examination. Students following this refresher course were given special booklets and shown short films reflecting special features of their occupations.

Setting: Houses for Health Education (HHE) or at the Sanitary Epidemiological Stations (SES)

Target: Personnel working in the public catering and food trade services

Agency: Central Institute for Scientific Research in Health Education of the Ministry of Health of the USSR

Intervenor: Specialists on food and nutrition hygiene and other SES medical officers specialized in different branches

EVALUATION

Design: Cross-sectional survey

Description: To compare two groups, one supervised training at SESs and HEDs and the other supervised plus independent training. Number of mistakes were compared.

COMMENTS

The evaluation is limited by the study design, lack of reporting on the selection and characteristics of participants. No information was provided regarding the validity and reliability of the data collection tools.
DESCRIPTION OF INTERVENTION - 1997

Goal: To reduce food safety violations in restaurants

Strategy: Inspection

Description: Although this study was primarily an evaluation on the effectiveness of standardized inspections and food handler training on violation frequency, this section is provided to describe the inspection intervention in the study.

The inspections were standardized based on the 1976 U.S. Food Service Sanitation Ordinance except that 4°C was used as the maximum allowable internal temperature for holding of potentially hazardous refrigerated foods. The potential hazard rating of each premise was based on a scale developed in Montana. This scale integrated five variables: range of hazardous foods served; extent of handling/preparation steps; number of meals served; hours of operation and maintenance demands. Food handling violations were quantified based on a standard weighted demerit-type 44 point inspection form, resulting in a final inspection score for each restaurant.

Potential temperature abuses were monitored by using thermometers for internal temperature determinations of food products, and using heat-sensitive tapes to determine dish temperatures during hot water sanitizing.

Food handler training was not provided and evaluated in the intervention, however, data on training history was collected systematically from staff on site at the time of the inspection. Self-reported information on food handler education was obtained, including duration of the course (ie. under five days, five days or more); the type of course; whether certification was given; and length of time since the last course was taken.

Setting: Non-franchise restaurants

Target: Food premise supervisors and food handlers

Agency: Department of Health Care & Epidemiology, UBC; BC Ministry of Health; Health Canada

Intervenor: Public health inspectors

EVALUATION

Design: Cross-sectional

Description: ?

COMMENTS

Major concerns for bias from potential confounders such as score of last inspection. Staff motivation was not taken into account.

DESCRIPTION OF INTERVENTION - 1997

Goal: To reduce the incidence of foodborne illnesses

Strategy: Food handler training; inspection

Description: This study was an evaluation of the effectiveness of food safety training and routine restaurant inspections. A mail out survey was designed to determine the practices, policies and potential outcome measures of the two interventions. This summary focuses on a description of the two programs, rather than their evaluation.

Foodhandler training courses were held at community colleges and technical schools. Foodhandler training courses were also offered by the school systems. Details on the course content were not provided.

Routine inspections are defined as on-site observations and recording of information that was routine or scheduled, not a follow-up inspection and nor due to a complaint.

Setting: Restaurants

Target: All foodhandlers

Agency: Department of Health Care & Epidemiology, University of British Columbia, British Columbia Ministry of Health and Health Canada

Intervenor: Public health inspectors

EVALUATION

Design: Cross-sectional

Description: This was an observational study, and as such the researchers did not apply an intervention. Researchers measured the co-relationship between duration since most recent routine inspection of a random selection of restaurants and scores on standardized inspections of restaurants. Comparisons were also made between the past history of food service education of the managers and the staff with the inspection scores.

COMMENTS

Major concerns for bias from subjectivity of classifications of retaurants, and potential confounding due to variability in enforcement methods, local factors, education of food handlers, etc.

DESCRIPTION OF INTERVENTION - 1997

Goal: To develop an educational resource to enhance food safety knowledge for occasional quantity cooks.

Strategy: Food handler training/certification

Description: The curriculum was based on HACCP and emphasizes critical thinking to identify critical control points where pathogens could enter or proliferate in the food system. The curriculum consisted of background information, five lesson plans with both didactic and experimental learning content, a participant’s manual, teaching aids, marketing materials and evaluation tools. The lesson plans focused on essential practices during purchase, storage of ingredients, preparation, storage and transportation of prepared foods, handling of leftovers and cleanup.

Setting: Not described

Target: Volunteer quantity cooks (ie. Individuals who produce large quantities of food on a voluntary, part-time, non-professional basis).

Agency: Department of Human Nutrition, Ohio State University

Intervenor: Food safety educators, including extension agents from the U.S. Department of Agriculture, 4-H volunteers, sanitarians (ie. public health inspectors), and camp food service directors.

EVALUATION

Design: Cohort one group pre + post (before and after)

Description: In this study, knowledge was assessed both pre- and post-program, and the differences in scores of educators and volunteer quantity cooks were determined. A behavioural checklist was used to monitor self-declared food handling behaviour at the time of attendance and three months after participation.

COMMENTS

Major concerns regarding comparability of intervention and comparison groups and the soundness of the outcome assessment. Minor concerns about reproducibility of the intervention.

DESCRIPTION OF INTERVENTION

Goal: To increase the compliance of marginally compliant food establishments.

Strategy: Inspection

Description: A progressive procedure linked inspection frequency to the level of compliance. Food establishments were divided into high scoring establishments of 95 and above; mid-range scores of 80-94; and low scores of 79 and below based on the averages of the last four routine inspections spanning the previous two years. The procedure proportionally increased contacts with the lower scoring establishments until scores are improved (bimonthly inspections) and at the same time, decreased inspection frequency in the high-scoring establishments.

In addition, the program provided for recognition to those establishments with consistently high scores that meet specific criteria. Blue ribbon awards of excellence were presented for display in the facility.

Setting: Foodservice establishments

Target: Foodservice establishments

Agency: Scott County Health Department

Intervenor: Public health inspectors

EVALUATION

Design: Cohort – one group pre + post (before and after)

Description: In this study, the inspection scores for marginally compliant food establishments were assessed and compared pre- and post-intervention (one year later). Scores were also examined for the bimonthly inspections until the establishment scored above the low range indicator. The numbers of establishments receiving “blue ribbon awards” in the first year of the program were compared to those in the second year.

COMMENTS

The evaluation is limited by the lack of reporting on the characteristics of the establishments. No information was provided regarding withdrawals and drop-outs of the establishments, with the exception of establishments identified as low range and those awarded blue ribbons. The outcome assessors were not blinded to the intervention status of the establishment.
DESCRIPTION OF INTERVENTION - 1997

Goal: To reduce food safety violations in food service establishments.

Strategy: Food handler training/certification

Description: Food hygiene courses were given to managers and supervisors of food service establishments as part of Food and Waterborne Diseases Control Program administered by the Office of professional Standards and System Analysis, Ministry of Health, Bahrain (1981). The training course was given over two consecutive mornings. The first session covered topics of bacteria and their significance in foodborne illness through an interactive exercise where participants collected samples of bacterial sources on sampling plates. A series of slides that covered the most common food pathogens was shown (Center for Disease Control, 1974). The inspectors then discussed the standard inspection checklist (survey) and participants were asked to go back to their establishments with a copy of the checklist and make a self-inspection of their operation.

The next session involved presentation of the plate growths. The inspection checklist was also discussed to clarify any misunderstandings of the inspection items, their compliance, or public health reasons for their inclusions. The class was then divided into groups to work on the following exercises: how to clean and disinfect a slicing machine; a cutting board; or fruits and vegetables to be eaten raw. Group presentations were made to the rest of the class, and acceptable methods for performing these tasks were demonstrated. A series of slides was shown again which reviewed factors that contribute to outbreaks of foodborne disease and their prevention.

Setting: Not described

Target: Food service establishment managers and supervisors

Agency: Ministry of Health, State of Bahrain

Intervenor: Public health inspectors

EVALUATION

Design: Cohort (analytical two groups pre + post)

Description: In this study, a pre-training test was given to all participants to assess their pre-existing knowledge of food safety standards and practices. The same test was given after the course to evaluate learning. The pre- and post-intervention inspection scores of non-randomly assigned intervention and control groups were compared.

COMMENTS

Major concerns regarding comparability of intervention and comparison groups and the soundness of the outcome assessment, and minor concerns about the soundness of the outcome assessment.

DESCRIPTION OF INTERVENTION

Goal: To increase safe food handling behaviours.

Strategy: Food handling training/certification

Description: Food safety programs conducted by the Texas Agricultural Extension Service. Curriculum not described.

Setting: Not described

Target: Consumers

Agency: Texas Agricultural Extension Service

Intervenor: Texas Agricultural Extension Service

EVALUATION

Design: Cross-sectional survey

Description: In this study, telephone interviews with randomly selected program participants were used to determine food handling behaviour and adoption of safe food handling behaviours. Sixteen food handling survey questions collected both pre- and post-behaviours after program participation.

COMMENTS

The evaluation is limited by the weak study design, lack of reporting on the characteristics of the participants. No information was provided regarding participant rate. The outcome assessors were not blinded to the intervention status of the participant.

DESCRIPTION OF INTERVENTION - 1997

Goal: To maintain sanitation standards at airport cafeterias.

Strategy: Food handler training/certification

Description: Airport employees are provided with an educational package which basic knowledge of foodborne disease, their transmission, and the laws and regulations pertaining to the operation of a food service facility (Ontario Ministry of Health Guidelines). The content of educational material not well described.

Setting: Lester B. Pearson International Airport (Terminals I and II)

Target: Airport food handlers

Agency: Lester B. Pearson International Airport

Intervenor: Not described

EVALUATION

Design: Randomized Controlled Trial

Description: In this study, a pre-test/post-test was administered to the intervention group and a control group and resultant scores were compared.

COMMENTS

Major concerns regarding comparability of intervention and comparison groups, reproducibility of the intervention and the soundness of the outcome assessment.
DESCRIPTION OF INTERVENTION - 1997

Goal: To increase sanitation awareness and knowledge of foodservice managers. To develop and improve food handler practices by consultation during inspections.

Strategy: Food handler training/certification, Inspection

Description: A manager training program was implemented. Two sessions, each two hours long, presented information to managers about various aspects of sanitation practices. At least one-half of each session was spent discussing the material presented and its application to the daily restaurant operation. The first training session covered topics on foodborne illness, bacteria, time-temperature relationships, ordinances and inspections. Photographs from the participant’s restaurants were also used to illustrate topics and encourage participation during the discussions. At this session, each manager also received a copy of the initial survey report of their establishments and general comments were reviewed.

Setting: Fast food takeout restaurants

Target: Restaurant managers

Agency: University of Washington School of Public Health & Community Medicine (U.S.A.)

Intervenor: Not described

EVALUATION

Design: Cohort one group pre + post (before and after)

Description: In this study, inspection scores done before and after managers received food safety training (no control group) were compared.

COMMENTS

Results from 1997 study - Major concerns regarding comparability of intervention and comparison groups, and minor concerns about reproducibility of the intervention and the soundness of the outcome assessment.

DESCRIPTION OF INTERVENTION - 1997

Goal: To improve the sanitary conditions of foodservice establishments.

Strategy: Food handler training/certification

Description: Voluntary and mandatory food service managerial certification training programs listed under the Food and Drug Administration's “Food Service Managers Training and Certification Program Directory (1980)” were surveyed using a self-reported questionnaire. The status, curriculum, audio-visual aids used and presentations were assessed. A lot of variation existed within and between the two training programs (eg. Texts used, audio-visuals, length of sessions, class size, etc.). In addition, programs were implemented in diverse ways.

The majority of the programs used texts developed by the individual agencies. Common texts used in the training programs included:

- Applied Food Service Sanitation
- Preventing Food-borne Illness
- Quantity Food Sanitation

The Food and Drug Agency developed a 15-hour training program. Also, the national Institute for the Food Service Industry's “Applied Food Service Sanitation Certification Course” was another 15-hour program. Further details on the content of these programs were not provided.

Setting: All foodservice establishments (USA)

Target: Foodservice managers

Agency: Department of Environmental Health, East Tennessee State University

Intervenor: Not described

EVALUATION

Design: Cross-sectional

Description: In this study, a comparison was made between self reported perceptions of directors of managerial food service training programs in districts where these programs were mandatory versus districts where they were voluntary.

COMMENTS

Major concerns regarding comparability of intervention and comparison groups, reproducibility of the intervention and the soundness of the outcome assessment.
DESCRIPTION OF INTERVENTION - 1997

Goal: To create and implement a food-safety curriculum for second- and third-grade elementary students.

Strategy: Community-based education

Description: An educational curriculum entitled “Discovering Food Safety – Detective Mike Robe’s Fantastic Journey” was administered to the target audiences. This package was designed to teach students to identify where food-safety problems may occur during food preparation and storage, how to prevent potential hazards, and to recognize possible consequences of foodborne illness. The program uses interactive and experiential learning techniques and creative audiovisual presentations. The curriculum contained four lessons of 30 to 60 minutes each. Teaching outlines, references, background information, and scenarios were provided for each lesson. The following lessons were included in the curriculum:
- Introduction to Food Safety
- Bacteria – What are They?
- Time/Temperature and Storage/Handling
- Evaluation

This program also includes the book and audiotape entitled “Microbes and Bacteria”. Pamphlets from the Food Safety and Inspection Service, and the US Department of Agriculture, were sent home with all the children. A revised curriculum was used in selected schools chosen for their ethnic, cultural and racial diversity. The assistance of paraprofessionals from the Expanded Food and Nutrition Program (EFNEP) were used to present the curriculum and to help with reading and translating the knowledge-testing questions.

Setting: Elementary school

Target: Second- and third-grade elementary students

Agency: Food Science and Nutrition Department at the University of Rhode Island (U.S.A.)

Intervenor: Elementary school teachers, Aides from the Expanded Food and Nutrition Program, Rhode Island

EVALUATION

Design: Cohort one group pre + post (before and after)

Description: Pre- and post-training knowledge tests were administered to the children. Scores were compared.

COMMENTS

The evaluation is limited by data collection tool and blinding of the outcome assessors.
DESCRIPTION OF INTERVENTION - 1997

Goal: To improve knowledge of food safety principles and use of safe food handling practices.

Strategy: Community-based education

Description: A nutritionist and a public health inspector gave 1.5-2 hours guided tours of a grocery store to show participants how to make safe and healthy food choices. In-store food demonstrations by a home economist from the community also provided ideas on food preparation.

Setting: Supermarket store

Target: Women from the local community

Agency: Middlesex-London Teaching Health Unit, Public Health Department

Intervenor: Nutritionist, Public health inspector

EVALUATION

Design: Cohort one group pre + post (before and after)

Description: In this study, community members who participated in a supermarket food safety educational tour were tested for their knowledge and self-reported behaviour before, immediately after and 6 weeks after the intervention.

COMMENTS

The evaluation is limited by the selection of participants. No information was provided regarding blinding of outcome assessors or validity and reliability of data collection tool.

DESCRIPTION OF INTERVENTION

Goal: To assist food service representatives in identifying and monitoring the critical control points for safe food handling.

Strategy: Food handler training/certification

Description: Training component of the Philadelphia Food Safety Certification Program. The SERVSAFE curriculum was used and the book was distributed to all participants.

Setting: Not described

Target: Food handlers

Agency: Philadelphia Department of Public Health

Intervenor: Not described

EVALUATION

Design: Cohort (analytic two groups pre + post)

Description: In this study, establishments were randomly selected from each geographic district in city. The telephone survey posed 14 multiple choice questions about key issues covered in the food safety courses including handwashing, equipment cleaning and usage, utensil sanitization, cross-contamination, thawing, processing and the hazard analysis critical control point (HACCP) method with at least one question from each of the sections of the SERVSAFE curriculum. Certified and non-certified employee from each establishment participated. Certified employee scores were compared to non-certified employee scores.

COMMENTS

The evaluation is limited by the lack of reporting on the characteristics of the participants. No information was provided regarding withdrawals and drop-outs or blinding of the outcome assessors. In addition the data collection tools were not shown to be valid or reliable.

DESCRIPTION OF INTERVENTION - 1997

Goal: To utilize a process-oriented approach to encourage more active owner/operator participation in food service establishment inspections.

Strategy: Food handler training/certification, Inspection

Description: The HACCP program was introduced into medium risk food premises. Regulation infractions were recorded, and critical control points where proper food handling techniques have not been used were highlighted. A risk factor was recorded, and the written report on standard inspection forms was discussed with food premise personnel. During the discussion (usually lasting 45 minutes), both positive and negative aspects of the inspection were reviewed. Risk assessment criteria were based on weightings from epidemiological associations between food handling and foodborne illness developed by the Centres for Disease Control (U.S.A.).

Setting: Medium food risk premises

Target: Food premise operators and owners

Agency: Durham Regional Health Unit

Intervenor: Public health Inspectors

EVALUATION

Design: Cohort one group pre + post (before and after)

Description: In this study, a pre-test of knowledge, beliefs and behaviours in food handling safety was administered to the participants, a HACCP intervention was implemented and a similar post-test was completed.

COMMENTS

Major concerns regarding comparability of intervention and comparison groups and the soundness of the outcome assessment, and minor concerns about reproducibility of the intervention.
DESCRIPTION OF INTERVENTION - 1997

Goal: To assess the overall condition of low risk food premises
To determine the optimum inspection frequency for these premises

Strategy: Inspection

Description: The project analyzed the allocation of food service facilities as “low risk”. Low risk premises were designated as those premises which do not prepare hazardous foods but meet one or more of the following criteria, which comprised a part of the Food Premises Risk Assessment Designation:

- Serve pre-packaged hazardous foods
- Prepare and/or serve non-hazardous foods without meeting the criteria for medium risk
- Are used as a food storage facility
- Where public health concerns relate primarily to sanitation and maintenance (e.g., food stores, food banks, refreshment stands, catering vehicles, food processing plants, milk depots, cocktail bars, etc.)

Inspections were carried out on premises previously categorized as “low risk”, and listed as such in the North York Environmental Health Information System (EHIS). Information on the overall condition of the premises was collected on a checklist that contained the requirements of the Food Premises Regulation (FPR) 562/90 that were important in low risk premises. The requirements of the checklist were categorized into High, Low or Unclassified Risk Priority, as per the Delphi Survey developed to prioritize the deficiencies or violations of statutory standards, and to know which of the indicators have a higher likelihood of contributing to illness. The checklist was composed of five areas of concern: retail area, food preparation, sanitary facilities, garbage disposal and general maintenance and cleanliness of the equipment and premises. Each of these areas were analyzed on EPI INFO, a statistical program, to determine the overall condition of the low risk premises inspected during this project.

Setting: Low risk food premises

Target: Owner/operator

Agency: City of North York Public Health Department, Environmental Health Division

Intervenor: Public health inspectors

EVALUATION

Design: Cross-sectional survey

Description: In this study premises previously designated as “low risk” were assessed for their hazard rating to determine what proportion had actually changed to being a higher risk.

COMMENTS

Major concern due to selection and observer bias
DESCRIPTION OF INTERVENTION

Goal: To use the results from the utensil swab test as an educational tool during periodic inspection of food establishments.

Strategy: Food handler training/certification

Description: The swab test is a standardized test that measures the bacteriologic conditions of food utensils. The result of the test is expressed by the number of bacteria picked up from the utensil surface. In Israel, inspections were performed once a year with the swab test carried out as part of the annual inspection.

Setting: Foodservice establishments

Target: Food handlers

Agency: Public Health Laboratory, Haifa, Israel

Intervenor: Public health inspectors

EVALUATION

Design: Time series

Description: In this study, two to seven swab samplings were taken at intervals of two to three months. Bacteriological scores were compared to determine if there was progress through time associated with repeated samplings.

COMMENTS

The evaluation is limited by the lack of reporting on the characteristics of the establishments. No information was provided regarding withdrawals and drop-outs of the establishments or for the blinding status of the outcome assessors.
DESCRIPTION OF INTERVENTION - 1997

Goal: To improve foodservice management practices in food safety for staff at community-based adult-care facilities.

Strategy: Food handler training/certification

Description: The program was designed to address the four basic foodservice management practices; food purchasing, menu planning, food safety and food storage. All facilities were audited on their performance in these four areas.

Two instructional approaches were implemented: a one-day educational workshops on food preparation with a food safety manual developed specifically for adult-care facilities (ACFs) or presentation of the manual only. The workshops were designed to provide basic foodservice management training to the facility staff and guide them through each section of the manual. The sessions were based on questions addressed in the facility's audit. Participants were also given time to practice application of the information, such as by designing menus.

The manual used was a modified version of “Foodservice Manual for Small Health Care Facilities” (Soneff, 1990). This manual marked specific references to the Province of British Columbia’s quality assurance standards and regulations, and provided guidelines for four basic areas of foodservice management listed above. The reading level of the manual was about an eight-grade level.

Setting: Adult care facilities

Target: Staff at community-based adult-care facilities (<25 beds)

Agency: School of Family and Nutritional Sciences, UBC

Intervenor: Dietitians (auditors), registered dietitian nutritionist (workshop presenter)

EVALUATION

Design: Randomized Controlled Trial

Description: In this study, six health units in British Columbia were randomly allocated to one of three different intervention groups. Within each of these health units, all adult care facilities that met the inclusion criteria and agreed to participate were given the food safety intervention designated for that health unit. For one group of facilities, the food handling staff participated in a workshop on food safety. For another group of facilities, a manual on food safety was provided to the staff. The third group of facilities served as a control. Facilities were inspected before and after the intervention on the issues of food safety and food storage (outcomes related to nutrition were also assessed.

COMMENTS

The evaluation is limited by selection bias, confounders and blinding.

DESCRIPTION OF INTERVENTION - 1997

Goal: To develop a training manual and a specific training format to be used by foodservice supervisors and managers with limited knowledge of sanitation concepts and teaching experience.

Strategy: Food handler training/certification

Description: A training manual was evaluated using a three-step development process. Two training modules were prepared which covered basic concepts of food preparation and sanitation. Each module offered step-by-step training process and teaching techniques, including: considering the participants’ existing knowledge; discussing course objectives and extent of achievement; encouraging open discussion of concepts presented; encouraging participants to recount personal experience related to concepts being discussed; and devising solutions to problems currently existing on the job. The manual was reviewed by a panel of experts from nutrition, public health, school foodservice administration, food science, and clinical dietetics.

The sanitation module was used by a staff member associated with each food preparation centre in a 3-hour training session. The training was observed and videotaped, and the trainer’s performance was recorded using a 20-point tool developed to determine the trainer’s ability to follow manual guidelines. Trainers were also given self-evaluation forms to complete.

Setting: Food preparation centres of the Capital Area Agency on Aging (Texas)

Target: Directors of established meal programs for the elderly in Texas

Agency: University of Texas at Austin

Intervenor: Managers of food preparation centres

EVALUATION

Design: Cohort one group pre + post (before and after)

Description: In this study, pre- and post-training knowledge scores and self-reported behaviours of participants, (no control group) were compared.

COMMENTS

Major concerns regarding comparability of intervention and comparison groups, reproducibility of the intervention and the soundness of the outcome assessment.

DESCRIPTION OF INTERVENTION

Goal: To increase food service knowledge.

Strategy: Food handler training/certification

Description: A programmed text was developed for the food service task of cleaning a food slicer. The tasks were broken down into detailed steps, colour photographs were taken and printed. Additional explanations and fill-in-the blank questions were typed under each picture. The questions were constructed so that the subject usually would fill in the missing word correctly. The appropriate answers were placed on the right side of each page so that the subject could check her own answers. A 2x6 inch hard paper cover board was given to the trainee to hide the provided answers.

Setting: Not described

Target: Female women food handlers from foodservice units of three residence halls at Kansas State University

Agency: Departments of Institutional Management and Industrial Engineering, Kansas State University

Intervenor: Not described

EVALUATION

Design: Time series

Description: In this study, an oral test was administered after the subject completed the self-training, after one week and after one month to determine amount of information retained.

COMMENTS

The evaluation is limited by the study design, selection bias and lack of reporting on the characteristics of the participants. No information was provided regarding validity and reliability of the data collection tools. The blinding status of the outcome assessors was not described.

DESCRIPTION OF INTERVENTION

Goal: To provide a better understanding of the principles and practice of food hygiene.

Strategy: Food handler training/certification

Description: Food handler training not described

Setting: Food establishments

Target: Food handlers

Agency: Middlesbrough Public Health Laboratory

Intervenor: Not described

EVALUATION

Design: Cross-sectional

Description: In this study, food hygiene principles and practice knowledge were assessed via a set of 20 multiple choice questions selected from those currently used in the examination for the Institution of Environmental Health Officers basic food-hygiene certification. When possible a manager, supervisor, and two food handlers completed the questions by choosing the most appropriate answer from four alternatives available.

COMMENTS

The evaluation is limited by the study design, selection bias and lack of reporting on the characteristics of the establishments.

DESCRIPTION OF INTERVENTION - 1997

Goal: To enhance the degree of sanitation in food service establishments.

Strategy: Inspection

Description: The intervention was a comprehensive plan review approach to food service establishments inspections involving setting stringent requirements for floors, walls, ceiling, lighting, plumbing, and equipment. These standards were contained in a “Construction and Design Standards Manual”, adopted in 1978. The plan review process applied to all new restaurants constructed after November, 1977, as well as to any existing restaurants which changed ownership after November, 1977.

Specific requirements for structure and equipment were based on categories of establishment determined by the types and volumes of food items prepared. The goal of the designs were to maximize efficient cleaning products while minimizing the potential for vermin harborages. The philosophy behind the plan review was that all restaurants which are designed for easy cleaning would more likely be cleaned properly than ill-designed restaurants.

Setting: Food service establishments

Target: Food service establishment owner/operator

Agency: Garland Environmental Management Department, Texas, U.S.A.

Intervenor: Environmental health practitioners

EVALUATION

Design: Cohort (analytical two groups pre + post)

Description: In this study, to study the efficacy of the comprehensive plan review program, restaurants were inspected using form PHS-4006, of which seven items were used to note structural violation. A survey was also used to gather information on the management characteristics. Details of the content of the survey questions were not provided. Total demerit scores were compared between the plan review and non-plan review establishments.

COMMENTS

Major concerns regarding comparability of intervention and comparison groups, no concerns about reproducibility of the intervention and major concerns regarding the soundness of the outcome assessment.

DESCRIPTION OF INTERVENTION

Goal: To ensure that every food handler received basic instruction in food hygiene and related personal hygiene matters.

To achieve a positive attitude to food hygiene by all those people involved in catering and allied activities.

Strategy: Food handler training/certification

Description: The curriculum covered in the six one hour lecture periods included introduction and basic microbiology, food poisoning and food contaminants, food handling and temperature control, person hygiene, cleanliness of food premises and equipment, and pests and pest control. A Food Hygiene Handbook was designed and published. In addition, film and slides complemented lectures.

Setting: One classroom within a trailer in the King Khalid Military City

Target: Primarily catering staffs, initially supervisors and cooks but staff employed in the commissaries were also included.

Agency: Saudi Medical Services, King Khalid Military City, Saudi Arabia

Intervenor: Chief Environmental Health Officer, sanitarians and environmental technicians

EVALUATION

Design: Time series

Description: In this study, knowledge was evaluated by a multiple choice question/answer paper. Inspection scores were examined pre- and post-intervention over a four year period.

COMMENTS

The evaluation is limited by the study design, selection bias and lack of reporting on the characteristics of the establishments. The outcome assessors were not blinded to the intervention status of the establishment. The knowledge data collection tools were not shown to be valid and reliable.

DESCRIPTION OF INTERVENTION

Goal: To promote a healthy lifestyle by teaching 1) basic food preparation skills, 2) safe food handling practices and 3) application of the Food Guide Pyramid.

Strategy: Community-based education

Description: The Youth Cooking School curriculum included a detailed instructor’s guide, activity sheets and samples of Illinois 4-H manuals. The program consists of five half-day sessions during a one week period in the summer. Each lesson consisted of a lecture period, followed by hands on activities relating to the objectives for that lesson. Food was prepared every day. Each lesson began with a definition of the terms used such as germs, bacteria, contaminate, etc., and the day ended with tasting of prepared food.

Setting: Youth Cooking School

Target: Low income children aged 8 to 12 from 14 counties in southern Illinois

Agency: University of Illinois Cooperative Extension Service Family Nutrition Program

Intervenor: Instructors recruited from college-level food and nutrition students

EVALUATION

Design: Cohort – one group pre + post (before and after)

Description: In this study, participant’s knowledge and perceived behaviours were assessed by specific questions relating to food safety on a pre- and post-test, and follow-up test. The pre-test measured baseline knowledge and behaviours. The post-test assessed knowledge gain and self-reported behavioural change. The follow-up test assessed retained knowledge and behavioural change. The effectiveness was evaluated by comparing the scores of the pre- and post-test, and the pre-test and follow-up test.

COMMENTS

The evaluation is limited by selection bias and the lack of reporting on the characteristics of the establishments. The outcome assessors were not blinded to the intervention status of the establishment.

DESCRIPTION OF INTERVENTION

Goal: To help the businesses comply with current Food Safety legislation by providing a practical approach to hazard analysis that could be used directly in the business.

Strategy: Food handler training/certification

Description: This course introduced the concept of HACCP; provided an understanding of HACCP principles and enabled the participants to apply the principles practically in their business to ensure effective food safety management. The syllabus covered introduction to HACCP and its development, HACCP principles and terminology, and practical application of HACCP principles. A case study was presented which required the production of a flow diagram and a hazard analysis for a selected product. Participants were asked to supply a copy of the menu for their residential home that were examined and menu items categorized according to the production method. Course members were encouraged to produce a generic HACCP plan suitable for their industry sector. Those successfully completing the course and a short examination received the Certificate in Essential HACCP Practice.

Setting: Not described

Target: Representatives from residential homes

Agency: Royal Society of Health, Vale of Glamorgan, Residential Homes

Intervenor: Not described

EVALUATION

Design: Cross-section survey

Description: In this study, the participants were given a pre-test to determine their awareness of food safety hazards and controls. A short examination evaluated the knowledge post-intervention.

COMMENTS

The evaluation is limited by the weak study design and lack of reporting on selection procedure for participants. No information was provided regarding the validity and reliability of the data collection tools.
DESCRIPTION OF INTERVENTION - 1997

Goal: To improve food handling practices in food service establishments by providing manager training and certification.

Strategy: Food handler training/certification

Description: A training program was delivered that consisted of one full day and two half day sessions, each offered two weeks apart. The content of the training program was not described, but was based on the National Institute for the Food Services Industry (NIDI) textbook Applied Food Services Sanitation. The normal cost of the training program ($100) was reduced by 25% as a recruitment incentive.

Setting: Not described

Target: Managers of food service establishments

Agency: Oakland County Health Division (southeast Michigan)

Intervenor: Environmental health staff (ie. public health inspectors)

EVALUATION

Design: Cohort (analytical two groups pre + post)

Description: The pre- and post-intervention inspection scores of non-randomly assigned intervention and control groups were compared.

COMMENTS

Major concerns regarding comparability of intervention and comparison groups and reproducibility of the intervention. Minor concerns about the soundness of the outcome assessment.