

AN ABSTRACT OF THE THESIS OF

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Title: Assessment of Foodservice Managers' Awareness of  
Food Tampering Hazards and Evaluation of a Food Tampering  
Risk Reduction Program for Managers of Foodservice  
Facilities

Abstract approved:

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Food tampering in foodservice facilities, especially with self-serve foods, can result in consumer illness or injury and adversely affect the foodservice organization. This study explored foodservice managers' awareness and perceptions of risk and evaluated a Hazard Analysis Critical Control Point (HACCP)-based program of food tampering hazard reduction developed for managers.

The study had two phases, descriptive and experimental. The purpose of phase one was to determine food tampering awareness and opinions, to obtain descriptive information about foodservice managers and their facilities, and to identify the population for phase two. The purpose of phase two was to evaluate an educational workbook, which had been developed by the researcher, using a post-test for the experimental and control samples. One thousand foodservice managers in commercial and non-commercial foodservices were

contacted by mailed questionnaires in phase one; 376 continued on to phase two, one-half received both a food tampering risk reduction self-instructional workbook and a post-test; 238 completed the study.

The post-test included a food tampering hazard inspection form used to evaluate facilities. The managers' changes in opinions and actions to reduce food tampering hazards and their understanding of a HACCP-based program were identified and comparisons made through chi square analyses. More non-commercial foodservice managers than commercial managers had college degrees, but there was no significant association between education level and food tampering concern. Managers with self-serve foods reported greater concern than those without; managers aware of food tampering reported greater concern. Managers who had received the self-instructional workbook had greater ability to identify food tampering hazards through floor plan evaluation. No significant changes in food tampering concern or intent to take action to reduce risk were found after the post-test. However, increased awareness led to a trend of increased concern. It was concluded that the questionnaire and post-test both had educational effects on the participants.

The workbook and the inspection form are suggested as an educational program to increase awareness and concern for food tampering and the intent to reduce food tampering hazards by foodservice managers.

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Assessment of Foodservice Managers' Awareness  
of Food Tampering Hazards  
and Evaluation of a Food Tampering Risk Reduction  
Program for Managers of Foodservice Facilities

by

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ASSESSMENT OF FOODSERVICE MANAGERS' AWARENESS  
OF FOOD TAMPERING HAZARDS AND  
EVALUATION OF A FOOD TAMPERING RISK REDUCTION  
PROGRAM FOR MANAGERS OF FOODSERVICE FACILITIES

INTRODUCTION

Overview

Throughout the United States the potential exists for human illness resulting from the consumption of foods which have been intentionally or accidentally contaminated. This study investigates the intentional contamination of foods in foodservice facilities such as restaurants, schools, and hospitals primarily at the point of customer self-service. The term used for this is food tampering.

Food tampering is defined by the investigator as the "intentional contamination of foods by planned human acts for the purpose of causing human illness or injury". Webster defined tampering as "to alter for an improper purpose or in an improper way" (1). A more limited term is sabotage, which is defined as the "destruction of an employer's property or the hindering of manufacturing by discontented workmen; an act or process tending to hamper or hurt" (1).

Food tampering may be accomplished by employees or former employees of the foodservice facility or associated businesses. Individuals not associated with the foodservice facility may also choose foodservice for this action. However, foods may also be contaminated by an offending individual who has no malicious intent. An inexperienced foodservice employee may introduce a contaminant into foods without realizing the consequences of the action. Customers may contaminate foods offered for self-service. Contamination may be a result of the improper use of serving utensils, sampling foods, or poor hygiene techniques.

The offender who tampers with foods may use biological, chemical, or physical agents. Agents of contamination may include, but are not limited to, bacteria and viruses as biologicals; cleansers, pesticides, food additives as chemicals; and foreign objects such as glass or metal shavings as physical contaminants.

There are many points in the food chain where intentional food tampering or accidental contamination can occur, including agricultural production, processing, transportation, marketing, and food item preparation and service in foodservice facilities. Discussion of the risk of food tampering will be focused

on the point in the food chain where foods are consumed by customers eating in foodservice facilities, which include both commercial and non-commercial establishments. The intentional contamination of foods is emphasized.

Within the process of producing and serving foods in foodservice facilities, there are numerous opportunities for intentional and accidental food contamination to occur. Contamination can happen when foods are received, handled and prepared, stored, and served. One of the greatest potential opportunities for intentional and accidental contamination occurs with self-serve food.

The foodservice industry in the United States has undergone changes in styles of customer service. Consumers are demanding foods which can be prepared and served quickly. Customers also desire to have influence or control in the selection and preparation of meals. The foodservice industry has responded by incorporating the self-serve concept into food bars (2). Self-serve foods are vulnerable to contamination due to the easy access of the customer to foods. Protection of the food and control of the actions of consumers are difficult. Not all foodservice facilities which have self-serve areas were designed to prevent contamination. Many

existing operations, in response to the popularity of self-serve menu items, customer demand, and profit potential, added areas which were not well planned.

This study was prompted by a documented case of intentional food contamination in which over 750 people became ill with salmonellosis foodborne infection in 1984. There were forty-five hospitalizations (3). Initially six restaurants in The Dalles, Oregon had foods contaminated with Salmonella bacteria. Most of the contaminated foods were found in self-serve salad bars (4). Eventually ten of the thirty-eight restaurants in the town were implicated as sources of foodborne illness (3). The outbreak was linked to the intentional contamination of a salad bar ingredient of restaurant foods by devotees of the (late) Bhagwan Shree Rajneesh (5). Customers of the foodservice facilities suffered through illness. Employees of the facilities where the food tampering occurred were also infected (4,6). Business revenue was reduced and some restaurants closed (7,8,9).

Incidents of potential food contamination due to tampering continue to be reported. In 1990 supermarket managers in Virginia found foreign material in crocks of soup at their salad bars. Syringes with hypodermic needles attached which contained traces of blood were in

the self-serve soup (10). Reports and actions of food tampering are not limited to the United States. In India at least 23 holiday revellers were hospitalized with suspected food poisoning after eating foods, termed "bhajias", served at a religious gathering. Seven persons were arrested for mixing the suspected illness-producing agent, "bhang", with the edible foods (11). Because cases of foodborne illness are under reported, the possibility exists that more foods, especially self-serve foods, may have been intentionally contaminated than have been identified. When the numbers of people affected are small, investigations may not be conducted or are not conclusive.

Food tampering risk reduction is important from two aspects. Consumers should be offered foods which have received optimum protection from contamination. Foodservice facility owners need to protect their business. The risks include not only loss of reputation but also the financial impact of an incident.

An approach to food safety control which has been used in the food processing industry has recently been applied to foodservice facilities. The Hazard Analysis Critical Control Point (HACCP) system is a preventive approach to quality control, initially in terms of microbial control (12). HACCP systems are intended to

prevent problems before they occur instead of finding problems in the finished food product (12). The hazards associated with the production of foods are evaluated, critical control points are determined, and ways to control and monitor the critical control points are developed (13).

The HACCP system is a practical method to help confirm food safety (13). Early definitions of HACCP systems were narrow and dealt primarily with the microbiological quality of food products. The scope of HACCP systems have enlarged and application of the approach now extends beyond the food processing plant. The approach can be expanded to include food safety, food and facility hygiene, and issues of economic fraud (14). The HACCP system has been used in postmortem meat inspections (15) and in the seafood industry (16). The HACCP system has been applied to different types of food production styles such as the sous vide (12) process in which partially processed foods are placed in bags and vacuum cooked. These products are only minimally heat processed and there are concerns for product safety if temperature fluctuations or mishandling occurs during production, storage, or consumer handling. The HACCP system has also been implemented for ready-to-eat

chilled foods sold in retail markets or foodservice facilities (17).

The widening use of the HACCP system represents the extension of the approach to foodservice facilities. Customization of the HACCP system is required for conditions in each foodservice facility (18) and must be updated whenever changes are made in the food, production, or handling methods.

### The Problem and the Study

#### Problem Statement

Intentional food tampering incidents which are successfully accomplished can result in illness for customers in foodservice facilities (3). Many foodborne illness outbreaks are not correctly reported or identified, therefore quantifying numbers of individuals affected is difficult (19). The foodservice industry is reluctant to bring the incidence of foodborne illness or food tampering forward to the public because of the potentially serious economic and social consequences of such actions. Fear of the "copy-cat" effect is also a concern. This lack of published documentation leaves many foodservice educators, managers, and equipment



suppliers unaware of the risk of food tampering (20). With this lack of awareness, there is also a lack of education concerning food tampering and risk reduction programs throughout the foodservice industry (20).

Food tampering risk reduction programs have not been identified as education or training programs by the foodservice industry. In-house food tampering risk reduction educational programs are not consistently used by the majority of foodservice directors, dietetic educators, or foodservice equipment manufacturers (20, 21). As a result, consumers are not provided the protection from food tampering at a level greater than the normal operation of the facility mandated by health regulations and organizational standards.

An additional concern is for protection of the investment of the owners of foodservice facilities. Costs from food tampering result in both dollar loss and human suffering (8). Costly litigation can result. Victims may have medical bills and lose time from work. Other costs incurred by the organization which are more difficult to measure include business and clientele loss from public knowledge of the incident and reduced employee morale and productivity (19). Disruptions in the personal lives of the victims who are both customers

and foodservice facility owners or managers may be significant yet difficult to measure.

### Purpose

The purpose of this study was twofold: first, to determine the level of food tampering awareness and opinions of foodservice managers in commercial and non-commercial foodservice facilities and to obtain descriptive information about the foodservice managers and their facilities; and secondly, to explore if a food tampering risk reduction educational program based on principles of the Hazard Analysis Critical Control Point (HACCP) system was effective for self-instructional use by managers of foodservice facilities. Could the program be used to assist foodservice managers to reduce the risk of food tampering, especially of self-serve foods, thereby improving the protection of the customer's health and the investment of the foodservice owner?

### Objectives of the Study

This study involved the assessment of foodservice managers' awareness and perceptions of food tampering

risk and the development and testing of a model food tampering risk reduction educational program for use by foodservice managers in the United States. The research objectives were as follow:

1. to determine the level of food tampering awareness of foodservice managers in the United States
2. to determine the foodservice manager's opinions about food tampering and perception of risk
3. to explore demographic characteristics of the foodservice managers and the foodservice facilities they represented as related to the area of food tampering
4. to determine the level of change of the foodservice manager's knowledge of food tampering after reading the self-instructional workbook
5. to determine the level of change in opinions, actions, and perception of risk of food tampering of foodservice managers after reading the self-instructional workbook
6. to determine if a food tampering risk reduction self-instructional program was effective for foodservice managers.

Initially, instruments for a model food tampering risk reduction educational program were developed and tested. The instruments included a survey questionnaire, a food tampering risk reduction self-instructional workbook (treatment), and food tampering hazard inspection form (post-test). The research population located across the United States was identified and documents were distributed by mail.

A two phase design was used to collect data in the study. A self-administered questionnaire was used in the first phase to assess the opinions and awareness of foodservice facility managers regarding food tampering. Demographic information about the respondents and the foodservice organizations they represented was obtained. Phase 1 respondents whose foodservices offered self-serve foods formed the population for Phase 2.

The Phase 2 population was divided into experimental and control groups. The experimental group received both the food tampering risk reduction self-instruction workbook (treatment) and the food tampering hazard inspection form (post-test). Control group members received only the post-test. Responses from Phase 2 were used to assess the level of change in knowledge and opinions after exposure to the food tampering risk reduction information.

## Questions and Hypotheses

This study used descriptive and experimental research techniques. The study was primarily exploratory since research in the area of food tampering risk reduction within foodservice facilities had not been published. The study consisted of two phases and data were collected in both phases. Descriptive data were obtained in the Phase 1 questionnaire to determine the respondent's food tampering awareness and opinions of food tampering and risk reduction programs. Distribution frequencies and chi square testing were used to analyze the data. Descriptive data included demographic information to characterize the educational background of the respondents and the size, location, and type of business of the foodservice facilities represented. Distribution frequencies and chi square analyses were used to test the questions.

### Phase 1: Opinions and Awareness of Food Tampering Issues

Several aspects of the general problem of food tampering were investigated by questions asked of the foodservice managers. These included:

- a. awareness of food tampering
- b. level of concern about food tampering occurring within their foodservice operation
- c. use of self-inspection based on HACCP principles as part of a food safety program
- d. belief that planning can reduce food tampering risk.

The relationship between foodservice managers' concern for food tampering and demographic characteristics or food tampering awareness were explored. These questions included inquiry into the relationships between:

- e. commercial and non-commercial foodservice managers and their concern for food tampering
- f. the amount heard or read about food tampering by foodservice managers and their concern for food tampering
- h. foodservice managers' level of food tampering concern and the size of facilities
- i. foodservice managers' perceived risk of food tampering and the location (urban or rural) of the foodservice facilities
- j. foodservice managers' concern for food tampering and differences in their level of education

- k. foodservice managers with self-serve foods and those without self-serve foods and their concern for food tampering in their facilities.

Additional questions investigated the education and practice of commercial and non-commercial foodservice managers. These questions included inquiry into the relationship between:

- l. commercial and non-commercial foodservice managers with respect to their educational background
- m. commercial and non-commercial foodservice managers and their use of in-house inspections and HACCP-based programs.

Phase 2 was the experimental portion of the study. The purpose of Phase 2 was to measure the effect of the treatment instrument by use of a post-test instrument. Data were collected to test the hypotheses and to compare Phase 1 and Phase 2 respondents as to change in opinions, risk perception, and intent to take action regarding food tampering. Seven null hypotheses,  $H_01$ - $H_07$ , were used to test the outcomes of use of the Food Tampering Hazard Risk Reduction workbook. The post-test document, the Foodservice Facility Assessment Form, was used to obtain the data. Four null hypotheses,  $H_08$ -

H<sub>0</sub>11, were used to determine if differences existed between the foodservice managers' responses to the Phase 1 questionnaire and to the Phase 2 post-test.

Comparisons were made between the Phase 1 respondents who continued with Phase 2. What changes, if any, occurred after exposure to the Phase 2 treatment and the post-test? Possible differences sought were changes in food tampering concern, perception of risk, and intent to take action.

#### Phase 2: Response to the Educational Document and Comparison of Phase 1 and Phase 2 Responses

Hypotheses tested were:

- H<sub>0</sub>1. There is no significant difference between the experimental and control groups with respect to their ability to identify food tampering hazard potential through floor plan evaluation.
- H<sub>0</sub>2. There is no significant difference between the experimental and control groups with respect to the level of concern for food tampering.
- H<sub>0</sub>3. There is no significant difference between the experimental and control groups with



respect to the level of self-expressed concern about food tampering in their foodservice facilities after using the Food Tampering Hazard Inspection form.

- H<sub>0</sub>4. There is no significant difference between the experimental and control groups with respect to their opinion that in-house inspections could reduce food tampering hazards.
- H<sub>0</sub>5. There is no significant difference between the experimental and control groups with respect to their understanding of a HACCP principle.
- H<sub>0</sub>6. There is no significant difference between the experimental and control groups with respect to their intent to take action to reduce food tampering hazards.
- H<sub>0</sub>7. There is no significant difference between the experimental and control groups with respect to foodservice facility mean tamper value scores.
- H<sub>0</sub>8. There is no significant difference between the foodservice managers before and after the post-test with respect to the concern for the

possibility of food tampering occurring in their facilities.

- H<sub>0</sub>9. There is no significant difference between the foodservice managers before and after the post-test with respect to their opinion that the use of in-house inspections could help reduce the possibility of food tampering.
- H<sub>0</sub>10. There is no significant difference between the foodservice managers before and after the post-test with respect to their opinion of action to take to reduce the risk food tampering risk associated with self-serve food in their foodservice facility.
- H<sub>0</sub>11. There is no significant difference between the foodservice managers before and after the post-test with respect to their intent to implement in-house inspections.

#### Significance of the Research

This research contributes to the literature pertaining to food tampering and risk reduction within the foodservice industry. Examination of the literature revealed no published research dealing with food tampering or food tampering risk reduction at the level

of foodservice facilities. No studies were found that identified facility design as a possible method of food tampering control for foodservice facilities. While HACCP-based programs are beginning to be applied to various situations for food safety concerns, no published studies identified food tampering risk reduction at the consumer level within foodservice facilities through the application of HACCP systems.

## REVIEW OF THE LITERATURE

### Overview of Food Tampering

Information concerning episodes of foodborne illness does not appear to be widely communicated among members of the foodservice community. This may be due in part to the negative public impact and potential loss of business revenue generated by foodborne disease outbreaks. Foodborne illnesses may be the result of either unintentional food contamination and mishandling of foods or the deliberate introduction of harm-producing agents into foods. The potential for the risk of intentional food contamination by food tampering exists.

The term "consumer terrorism" has been used in association with acts of product and food tampering. An increase in the incidence of consumer terrorism has occurred over the last ten years (22). Product tampering has been called a "sleeping volcano" because it can lie dormant for months but its unpredictable eruption can occur at any time (23). In 1986 one billion dollars worth of products were destroyed because of tampering emergencies (23). One consistent feature of consumer terrorism was that high-profile brand names,

including large food corporations, were often the mark for blackmailers. Examples of companies involved in tampering threats include Hormel, Gerber Baby Food, Jell-O desserts, Girl Scout cookies and regional dairies (23). An individual threatened to blackmail the Heinz food company by threatening to place poison, glass, and razor blades in baby food. He also was accused of a plan to poison Pedigree Pet Foods' Chum dog food (22). In Britain, an individual was jailed after trying to extort money from supermarkets by threatening to contaminate foods with AIDS-infected blood (22).

Non-food products have also been the target of tampering activities. On Thursday, September 30, 1982 product tampering became a national issue. The product, Extra Strength Tylenol capsules, had been adulterated with cyanide resulting in sudden death for seven consumers (24, 25). This misdeed was a national crisis in public safety and consumer confidence. The incident gave rise to federal regulation designed to require the packaging of over-the-counter products in tamper-resistant or tamper evident containers. New dimensions were added to the government's responsibilities for consumer protection (25).

Product tampering has become a crime more common than many people comprehend. The Food and Drug

Administration (FDA) resisted discussions about product tampering due to the fear of copycat crimes. However, a spokesman for the FDA reported that almost 650 confirmed cases of product tampering have occurred in the past decade which did not include threats aimed at obtaining money from food and drug companies (26).

Sabotage within industries or organizations has been explored. Gaicalone and Knouse (27) examined the role that personality plays in the justification of organizational sabotage behavior. They used a two phase study in which 120 business students were surveyed to create a list of 51 sabotage methods. In the second phase 274 other students rated justifiability of the methods. One method identified was to "put poison in the products". The study revealed that personality factors can affect the justification of wrongful employee acts (27). Other subtle forms of sabotage have been identified in industries. Several forms of sabotage in the work place are not noticed or accepted as poor employee morale such as deliberate absenteeism, turnover, or slowed production. DiBattista (28) stated that for management to recognize acts of sabotage, it must find out why it occurs. The most commonly given reason was personal frustration with employee supervision. Managers might contribute to sabotage by

the way employees are terminated. Frustration, resentment, and conflict can build in the former employee resulting in sabotage. Sabotage was most often caused by the working relationship of the worker and manager (28, 29). Sociologists have identified that conflict in the work place can lead to acts of sabotage (29). By decreasing conflict sabotage should also decrease. Political beliefs, boredom, greed, and religious fervor also have been cited as some of the reasons given for sabotage (22).

Acts of intentional food contamination can affect a large number of people. One documented case of food tampering which affected over 750 persons within the United States appeared in the literature (3). Food tampering has occurred internationally. Approximately 23 holiday revelers in India became ill after food was intentionally contaminated. Seven people were arrested for this act (11).

It is not known how many illnesses have resulted from the intentional contamination of foods within foodservice facilities. Fortunately, some cases of contamination were discovered before illness or injury resulted. For example, an employee contaminated the meat the day before it was to be served to 700 people at the University of Florida's homecoming barbecue. The

act occurred after an argument with his supervisor. The meat was discarded and other food was prepared (30). Many individuals affected by foodborne illness do not report their condition, believing they have only the flu (19). Although the majority of illnesses are caused by microbial or viral agents, the specific etiological agents are not of prime consideration in the scope of the study. Rather, the process by which the at-risk food may be contaminated was studied.

In order to ascertain if the foodservice industry is striving to protect consumers' health through food tampering risk reduction, the literature was approached from several directions. The review focused on food tampering reduction plans regarding foodservice facility design including history of design, analysis of design, floor plan and design development, and designing for self-service of foods. The Hazard Analysis Critical Control Point (HACCP) food protection model was investigated to determine if applications could be made to food tampering risk reduction.



Research in Food Tampering Reduction  
in Foodservice Facilities

Foodservice facility design

The earliest reference to food facility design management was published in *The Journal of The American Dietetic Association* in 1925 (31). Since that time, fields of study have included history of food facility design, food protection and risk assessment models, foodservice facility design and illness related to design deficiencies. The literature review contributed to a framework of information but no studies were found that dealt directly with analysis of food facility design as related to food safety through the protection of self-service foods.

Early discussions of foodservice design and equipment planning were documented in hospital settings. Equipment purchasing was generally the responsibility of the hospital dietitian (31). As the industry began to grow and the need for expanded food production was recognized, food facility planning included space planning so equipment could be added as needed (32). The importance of facility design began to emerge during the 1920's. Dietitians and architects started to work

together to generate facility design plans. Architects put the dietitian's concept of layout on paper and fine-tuned the design, taking into account structural parameters and physical functioning (33).

The majority of foodservice-facility-related research has been conducted in association with hospital and school foodservices. These facility types have included a research component or support for research in the operations due to their link with education. However, only a limited amount of literature has been published about facility design research. In a study of quantitative management practices in the profession of dietetics, only sixteen articles relating to the management aspect of food facility design were published in *The Journal of The American Dietetic Association* (JADA) between 1928 and 1969 (34). This number represents only 6% of a total of 234 quantitative management reports. The 234 reports were reviewed and classified by topic area, management topic, and year of publication. Data were tabulated and percentages calculated (34). Brown concluded that, while applications of quantitative management have been reported, a gap exists between knowledge and the operational use of such techniques. The transfer of technology was lacking (34). There have been no

facility design research reports with quantitative management application published in the Journal since 1969.

The importance of long-range planning has been identified for foodservice facility and design. However, food safety through tampering risk reduction has not been identified as part of the planning process. Long range planning techniques have been applied to foodservice facility design and layout projects. Research published in 1963 (35) described how the layout and design of a hospital foodservice facility was integral to its management. Foodservices that lacked long-range planning failed to relate the design to the functions actually performed. Good working relationships between the dietitian, architect, and administrator were needed in the planning process. The costs of construction and equipment were carefully considered to help control the operational costs and renovation expense (35).

Foodservice organizations have used computers incorporated into organization management. Early work with computers and foodservices was reported in 1967 (36). Computer-assisted management techniques were applied to foodservice simulations and management by 1975 (34). Tools to evaluate the performance of

foods services are important due to the high cost of construction and remodeling. Computer simulations have been used to determine dining room capacity and manipulate factors for maximizing available space. The simulation model was useful because it allowed the study of the effect of changes on the parameters of the foodservice system. The simulation appeared to be a good tool containing a quantitative basis for decision-making (37). Computerization has also been used in the food processing industry for plant design, equipment operation, and quality control (38-43).

Food facility design research that has been more recently published approached the subject of design from the viewpoint of establishing decor to produce aesthetic dining rooms with theme appeal (44). This contrasts with facility design approached from a food management, food product flow, or safety perspective.

The food processing industry has considered the plant and equipment layouts to be important to the sanitary design of the facility (45). Good design principles developed a product flow which protected the products against contamination. When existing plants were renovated, the desired straight line product flow was difficult to achieve. The engineer and designers

correctly located equipment so that it was accessible for maintenance, sanitation, and inspection (45).

### HACCP Food Protection Models

#### Background and Description

The Hazard Analysis Critical Control Point concept is a system that food processors and some foodservice organizations have used to help assure the safety of their foods. The HACCP system produces assurances in food safety which are greater than testing final products for microbial contamination. The HACCP system uses a step-by-step approach. First, each step of a process is examined for hazards, such as unacceptable contamination. Then processes in the operation where the control of hazards is critical to risk reduction are identified. These are called critical control points. Next, control measures and criteria are developed to control hazards. Control measures can include physical, chemical, or biological control. The last step is to monitor the critical control points to see that the process meets the established control measures and criteria.

The Hazard Analysis Critical Control Point system has been developed for the purpose of ensuring food safety. The HACCP system can be applied to a variety of problems because it is a common sense approach to preventing problems. Although technical knowledge is needed to anticipate and prevent problems associated with food operations, it is changed to a form that nontechnical persons can apply to their operation within the HACCP system (18).

The basic framework for the HACCP system is to evaluate the hazards associated with the foods produced, determine the critical control points, and seek ways to control and monitor the critical control points identified. Bryan (13) concluded that hazard analysis can be a tool to demonstrate the potential sources and modes of food contamination, microbial survival and growth. Potentially hazardous situations or procedures must be monitored to provide safe foods. The HACCP system is a practical method for helping to assure food safety and provides greater assurance than other inspection or quality control methods used (13). Several other studies concur with the benefits of HACCP systems and the use of quality assurance programs in foodservice facilities with diverse types of production (13, 46-52).

The HACCP system has advantages over the traditional end product sampling method for microbiological quality control. These advantages were given by Smith as:

1. It is forward looking and does not rely on after the fact testing to resolve a problem.
2. It is flexible and can be integrated with all stages of ingredient storage/manufacturing/distribution/marketing and in retail handling.
3. It documents all operations and procedures and ensures that product is produced within strict control limits.
4. It integrates several areas of expertise from within a production plant. (12, page 197)

There have been various definitions of terms used in HACCP systems. Critical Control Points were defined by the National Advisory Committee on Microbiological Criteria for Foods (53) as any point of procedure in a specific food system where loss of control may result in an unacceptable health risk. Snyder (54) offered definitions and modification of the USDA HACCP system which broadened the concept and included the definition of the critical control point as:

any operational step in a food processing system from growing, harvesting, raw materials, and ingredients through processing, manufacturing, distribution, marketing, preparation, and consumption of the food or beverage, where loss of control can lead to a health risk. (54, page 4)

The definitions used early in the development of the HACCP system were narrow and focused on microbial control or unacceptable end products of microbial etiology. This evolved out of the HACCP system and its close alliance with the field of microbiology. Garrett and Hudak-Roos (16) believed that such a narrow focus hindered the development of the potential of the HACCP system being fully realized in food protection programs.

The scope of the HACCP system has enlarged to include application beyond the food manufacturing plant. The concept of HACCP can be expanded to involve the full range of consumer hazards in food consumption including food safety, facility and food hygiene, and economic fraud issues (14). The development of refrigerated convenience foods which are pasteurized, not sterilized, have raised the question if HACCP systems should extend beyond manufacture to distribution, retail display, and even the home of the consumer (14).

#### Applications of HACCP Systems

Literature was reviewed to explore the scope and diversity of the HACCP system for possible application to food tampering hazard reduction programs. A HACCP-based inspection program can be applied to nearly any



process (55). The HACCP system has been used to assess potential points of food product contamination in the food processing industry, hospital and restaurant food production, and even tested in developing countries by application to street food vendors (13, 46).

A potential application of the HACCP system early in the food processing chain is that of postmortem meat inspection programs. The HACCP system has not been used as a formal method of regulatory control for slaughter and dressing (as of June 1991) (15). However, the Food Safety and Inspection Service of the United States Department of Agriculture is planning to implement the HACCP system as a total systems approach to food processing within the meat and poultry industry (55). Hathaway and McKenzie (15) discussed the traditional method of postmortem inspection and how scientific evidence may indicate that resources may be improperly directed with the traditional inspection method. They suggested that "the HACCP approach identifies and ranks microbiological and other hazards that can arise at each operational step in a food processing system and is a scientifically based system for process control" (15, page 471).

The use of HACCP systems for the seafood industry has been investigated by the National Marine Fisheries

Service. Consumers' concern and public perceptions that seafood is not safe and needs more federal inspection in part identified a need (16). HACCP systems can be applied from production to consumption and is a nontraditional type of noncontinuous inspection (16).

Poultry and meat products are frequently connected with outbreaks of foodborne illness (18). Reductions in foodborne illness could be realized through improved preparation and handling of meat and poultry products. According to Tompkin, "if the goal of reduced foodborne illness is to be achieved, it is necessary to identify the errors which are involved in food preparation" (18, page 795). Tompkin described the use of HACCP systems to improve the safety and quality of meat and poultry products. Principles of HACCP systems identified include developing the plan, conducting a hazard analysis, identification of critical control points, criteria for critical control point monitoring, monitoring and verification, and record keeping (18).

Smith et al. (12) discussed the application of the HACCP system to sous vide, or vacuum cooking, food processing. This technique extends the shelf life and keeping quality of fresh food. Sous vide processing has increased in response to consumers' needs for ready-to-eat, microwaveable, convenience foods. The processing

technique involves preparing foods, placing the product in heat-stable bags which are air-impermeable and vacuum sealing, pasteurization, and refrigerated storage. These products were only minimally heat processed and a shelf-stable product was not generated. There was concern for the safety of customers consuming sous vide products if mishandling of product resulted in temperature fluctuations during production, storage, distribution, and/or retailing up to the point of consumption. They identified that employee hygiene and good handling practices were important, as well as plant and equipment sanitation, to prevent inoculation of foods with pathogenic bacteria. Smith et al. recommended a HACCP system as a preventive means of microbiological quality control and provided a discussion of the practical application to sous vide meat and pasta products.

The HACCP system is being broadened to include product distribution. Kalish (56) described the HACCP system as a means of retaining the quality function through the distribution channel. Of consumer complaints on chilled juices produced by Tropicana, 72% seemed to result from temperature abuse. Critical control points in distribution, warehousing, and retailing of the juices were determined. An educational

program based on critical control points for sales, warehousing, and for the product handling network was created (56).

Daniels (14) reported on new-generation refrigerated foods and the potential for extending the application of HACCP systems to retail and home. This type of convenience food was described as fragile and temperature abuse could reduce sensory appeal and safety. Data from temperature audits in supermarkets indicated that the best control was found in fresh-meat counters, with only 4% above 50<sup>0</sup>F. The poorest control was observed in food purchased from delicatessen counters with 55.6% above 50<sup>0</sup>F. Temperature audits in products in home refrigerators were taken 24 hours after shopping. One out of four refrigerators was at or above 45<sup>0</sup>F.; one out of ten was above 50<sup>0</sup>F. The high refrigerator temperatures and possible presence of pathogenic microorganisms suggested that a consumer education program was needed. Education to advise consumers about food safety could be interpreted as part of an at-home HACCP system (14).

Another application of the HACCP system is to ready-to-eat chilled foods available in retail markets and foodservice establishments. These foods most commonly include roast beef, poultry, pork products,

Mexican-style foods, Chinese foods, potato salad, rice, and salads of pasta, meat, or egg (17). Such foods are often prepared and held for sale, a procedure which requires special care to protect food safety. Bryan (17) outlined an abbreviated HACCP system using egg-potato salad in foodservice establishments. The product flow from ingredient through production, display, to sales was followed. The HACCP system extension up to sales was indicative of the approach being applied to foodservice establishments.

HACCP systems must be customized to the conditions in each establishment. Each establishment has unique processes for the acquisition, preparation, storage, and distribution of food products. HACCP system plans must be updated to accommodate changes made to the processing of food or changes made to the operation of the establishment (18).

The Sanitary Assessment of Food Environment (S.A.F.E.) was introduced by the National Restaurant Association as an auditing system based on self-regulation through self-inspection (86). S.A.F.E. has been described as a "streamlined version" of the HACCP system. S.A.F.E. concentrates on food preparation and uses both objective and subjective observations of food-health issues. The S.A.F.E. program emphasizes the

relative risks of menu items, then uses the linear flow process of HACCP systems. The survey of the entire process of food preparation, viewing the sequential acts of the food service personnel from product delivery to service, was used to identify human error. A self-inspection schedule was developed to monitor the operation. S.A.F.E. was considered to be a simple procedure which primarily addressed food safety problems associated with humans (57).

#### Hazard Analysis: Risk and Benefit Analysis

Several authors, who discussed risk analysis of foods (58-63), were concerned primarily with toxigenic and carcinogenic potential from additives or naturally occurring products. However, there was a lack of literature dealing with risk at the consumer level of food consumption in foodservice facilities, such as the risk resulting from tampering. Therefore, selected studies relative to food risk analysis and decision-making will be reported followed by hazard analysis of tampering as part of the HACCP system.

Since early days there have been laws dealing with the adulteration of food and other deceptive practices. The purpose of legislation was to protect public health

(58). Massachusetts passed the first state law in 1784 which prevented the sale of unwholesome foods. The Department of Agriculture, established in 1862, instituted a laboratory for agricultural chemistry investigation (58). Much of the hazard analysis and risk assessment work has been concerned with food preservatives and colorings (58, 62) in an effort to assess the toxicity of food components. Schramm described four ways of assessing the potential toxicity to humans which could result from a food component. Methods included epidemiology, molecular structure analysis, short-term tests, and animal bioassay (58).

Food safety studied by government regulators and scientists incorporates constant comparisons between risks and benefits (64). Consumers make many decisions based on their judgement of the benefits and risks involved in the act considered. Not all risk/benefit decisions involving human health are easily evaluated, such as the cancer risk related to mycotoxin residues in food. With few exceptions, risks associated with food are hard to calculate (64).

Risks and benefits were classified as "vital" or "nonvital" (64). There was not always a clear difference between vital and nonvital risks but the categories of risk were at least psychologically

different (64). Vital risks were "necessary or essential to life", or "concerned with or manifesting life". Nonvital risk did not usually threaten life, but was the chance that injury or damage could occur. For foods, nonvital risks might involve removal of the product from the market, loss of convenience, or reduced satisfaction. Nonvital benefits could include increased satisfaction or convenience. Nonvital benefits and nonvital risks from foods were difficult to measure.

Risk may also be classified as "voluntary" or "involuntary". Voluntary risks included lifestyle choices such as participation in recreational activities, smoking, or alcohol consumption. Involuntary risks involved accidents, certain diseases, and some food consumption. Involuntary risks over which one has no control were feared more than voluntary risks where one could exercise some control (62).

Several types of benefits can be realized from food and food additives. Examples cited included health-related benefits, supply (larger variety of economically priced items available), and convenience. However, it was not easy to assess these benefits. Benefits to health were measured by quantifying the decrease in health risk. Other benefits were appraised by economic value (64).



There are potential health risks associated with food consumption. Five food-related risks have been identified; pathogenic microorganisms, naturally occurring toxicants, environmental contaminants, pesticide residues, and food additives (65). Risks associated with foods cannot be eliminated completely; absolute safety is not possible. Therefore the risk/benefit ratio needs to be directed towards the lowest possible risk (64).

Albanese reported on mathematical modelling for risk analysis and food safety (59). This discussion was within the scope of meat or poultry food production risk analysis. An actual complete risk analysis could deviate from a simplified, idealized version. He noted that risk analysis technologic procedures were not completely quantitative and objective. This was because factors of social and moral choice existed. Public distrust was seen in cost-benefit analysis and could have been due to the citizen's recognition that science is a historical process. For example, understanding of the effects of environmental exposure change with time as data and theory accumulate (59).

According to Kirschman, assuring public safety from chemical exposures is a complex process which requires testing, hazard evaluation, risk assessment, and risk

management (61). Accurate risk assessment requires precise and reliable data for toxicity and exposure components. The difficulty in discovering cancer causation has continued the debate over the means of determining and managing risks from carcinogens.

Food risk communication is a fairly new issue for food safety experts but risk communication has been a priority in environmental and occupational health since the early 1980's. Auld (66) discussed the issue of risk communication and food safety in terms of obstacles to effective food risk communication and provided guidelines for improving the communication process. The guidelines presented (66) were:

1. Be a resource to consumers and anticipate issues which may generate controversy.
2. Identify target audiences and assess their information needs.
3. Shape the messages for the target audiences.
4. Educate the public about food risks and benefits.
5. Use similar risk information for comparisons; avoid mixing voluntary and involuntary risks.
6. Explain risk information clearly with non-technical language.

7. Be open and truthful.
8. Establish relationships with media.

Hazard analysis is an integral component of HACCP systems (12, 15, 17). The severity of hazards and probability of occurrence are evaluated (17). "In any HACCP system, it is prudent to recognize that no system can give 100% security" (12, page 197). The HACCP system provides a higher degree of food safety assurance than traditional approaches in food-market and foodservice establishments (17).

Different applications of hazard analysis have been made, depending on the product and production system used. A system suitable to foodservice establishments was provided by Bryan (17). The main points included: 1) recipe review; 2) process/preparation review; 3) observing, measuring, and testing operations; 4) flow diagrams; and 5) assessment of severity and risks. Risk assessment was implied as part of testing and evaluation programs (60).

### Food Protection

Consumers have expressed concern about tampering of food products in food markets (67). Packaging industries have responded to the need for tamper-

resistant or tamper-evident packaging (23, 67, 68). Deignan described tamper-resistant (T.R.) packaging as "the measure of the degree of difficulty a would-be tamperer would have in manipulating and defeating the T.R. feature" (23, page 636); tamper evident (T.E.) "refers to the degree any unauthorized opening of a container is apparent" (23, page 197). Several different types of packaging have been developed for use by the food processing and packaging industries. Special container ends have been constructed of a paper foil panel which can be used to seal plastic, metal or composite containers. Food and non-food applications are available (68). A type of packaging material has been developed which changes appearance under physical stress. This change can indicate if products have been subjected to tampering (69). Customers also should assume responsibility by inspecting containers at the time of purchase and use (67) and being aware of the feature intended to indicate tampering (70). They may need to be educated as to what to look for to indicate tampering (23).

Protection guidelines for foods served in foodservice establishments are general and are not written to specifically address tampering. The Oregon

Administrative Rules, Chapter 333 Food Sanitation Rules  
address food protection from customer contamination:

Food on display shall be protected from consumer contamination by the use of packaging or by the use of easily cleanable counter, serving line or salad bar protector devices, display cases, or by other effective means. (71, page 18)

Secondly, protection of food from the consuming public during the display and service process necessitates requirements such as protector devices and good operational procedures for dispensing that preclude any incidental contamination. (71, page 19)

### Educational Approach

#### Instructional Design

If foodservice manager education is a means of reducing food tampering hazards, the instructional material should be designed and presented to maximize the learning process. Several types of instructional design concepts were reviewed. Contributions to the literature pertaining to the development of instructional material have been made by many individuals and organizations. The objectives of instructional materials can be related to the development of knowledge, understanding, skills, or attitudes (72) in the person receiving the instruction.

There are variations in the types of learners, the material presented, and environment where it is received. The most important measurement of whether or not the instruction is successful is the ability to properly state the objectives of the instruction (73).

Instructional materials have been designed for use by trainees or instructors and some may be useful to both audiences (72). The instructional materials can take several forms: information manuals focus on development of knowledge, understanding, or attitudes; procedure manuals outline the steps and tasks for trainees to follow to perform specified jobs or processes (72).

Written instructional materials can be developed by following a pattern of steps. Emerson identified these steps as:

1. Determine the objectives and the scope of the training program.
2. Outline the conditions under which the instructional materials will be used.
3. Make analyses to determine training content.
4. Select the content to meet the specified objectives of the course.
5. Prepare the course outline.
6. Develop the over-all pattern from the instructional material.

7. Set up the format or pattern for the units of instructional material and for the series of units as a whole.
8. Get together the data needed-resource material for the content.
9. Decide upon a style of writing.
10. Write the draft copy.
11. Prepare the illustrations.
12. Check and revise the written copy and the illustrations.
13. Try out the material.
14. Prepare the master copy for duplication. (72, page 3)

Questions relating to where the instruction should take place are discussed in the literature. Broadwell (73) compared the similarities and differences between classroom and on-the-job training. Good communication was a basic requirement of both types of instruction. The instructor has to be able to communicate information on the skills or concepts to be learned. If only written instructional material is used and no instructor is present, the information must be presented so the learner can understand the material and be motivated to learn. Words which are beyond the understanding of the learner can be blocks to effective communication. Visual aids, pictures, or models applicable to the topics of instruction can be used to help minimize the

use of words and aid instruction. A difference between classroom and on-the-job instruction was the natural work environment where on-the-job instruction took place. This was considered an advantage of the on-the-job location because instruction took place in a real situation under nearly actual conditions, rather than trying to simulate conditions in the classroom. This location reduces the amount of information which has to be transferred from the learning environment back to the work environment (73).

A type of instructional approach which has been used is in-house training. Tracey (74) discussed the use of informal in-house training programs to follow up more formal training programs. The use of informal training helped the organization to realize a full return on the initial training investment. Some of the most useful types of informal training were on-the-job programs for employees. Skills are demanded to solve current problems and future uncertainties. Examples of challenges which led to training needs included changing demographics of the work force, economic changes, technological advances, regulatory changes, and shifting value systems (74). Continued learning is needed to meet specific needs of individuals and organizations;



innovation and acceptance of change must be encouraged within the organization.

Different strategies have been used for information transfer. These include lecture, demonstration, performance method, and conference. The proper selection of strategies was needed to promote efficiency and effectiveness of the instruction (74). There was not a single instructional method that applied to all learning situations or to all instructional objectives. The system chosen must be as compatible with the objectives of instruction and the resources and constraints of the organization, learners, and instructors as possible (74).

Several types of instruction in which the learner takes the control and responsibility for learning are found in the literature. Self-administered instruction is an example of learner-controlled learning. Ribler provided the following definition of self-administered training:

Self-administered, learner-managed, or self-instructional training is, simply, that training in which the learner, student, or trainee determines which lessons to work and when to perform them. (75, page 91)

Self-administered training can be done at home, on the job, or other suitable place. The key advantage to this type of training was the low administrative cost.

Learners often felt that they could learn better if they could control factors such as the time, place, and length of instruction. A large number of individuals in many locations could be trained with this method. Disadvantages included greater initial costs for material development and packaging but later savings of money and student and instructor time could result. Difficulty in learner motivation was sometimes a disadvantage to this approach (75).

Ribler suggested the following set of criteria as general guidelines for the selection of self-administered learning:

1. The student population should be large or geographically scattered.
2. The population probably will be heterogeneous.
3. The subject matter may be too personal for classroom application.
4. Pre-course orientations are required.
5. Time and facilities constraints do not permit an instructor-led format.
6. Replacement training of a substantial number of people in many locations is needed.
7. Availability of instructors is limited over an extended period of time. (75, page 40).

Other factors such as the complexity of the material or costs influence the selection of the instructional method (75).

Stockard explored benefits and drawbacks of self-instruction and expressed caution in the use of the method and materials (76). Ready-made, self-instructional courses have been developed for covering various topics. Courses in university level statistics have been taught with self-instructional materials and tests showed that learning was as good or better than by teaching with conventional methods (76). Basic education skills and mechanical arts have been formatted into the self-instructional approach. Some individualized, learner-paced courses have been multipurpose: they can be used for preliminary training to orient, motivate, and help identify areas of strengths and weaknesses; they can be used as refresher courses for follow-up and supplementary instruction (76). Stockard cautioned that it could be dangerous to rely too much on self-instructional courses. "People are better people developers than machines and cleverly constructed instructional materials" (76, page 83). At some time, learners might want to discuss the material with an instructor or someone knowledgeable in the subject of instruction.

Programmed instruction is an outgrowth of the work of Harvard psychologist, B.F. Skinner (76). Programmed instruction is a type of self-instruction where the

learner proceeds through a series of steps leading to the gaining of knowledge or skills consistent with the instruction objectives (74). According to Stockard:

Its basic principle is that one learns quickest and retains the most by learning one thing at a time, systematically, with sufficient repetition and reinforcement through immediate confirmation of the accuracy of the learner's response to test questions. (76, page 188)

Programmed instruction can be used to upgrade production, administration, promote special skills and knowledge, or to provide vertical or horizontal enrichment in a content area (74). Self-instruction or programmed instruction has been successfully used in universities, high schools, and lower levels (76).

Advantages and disadvantages to programmed instruction were present in the literature. Several advantages to programmed instruction were offered by Tracey (74). This style of learning reduced the failure rate because programs were tested and validated before use. Since programmed instruction materials are self-paced, the information was available at the rate most suitable to the individual. The approach used forced-response and immediate feedback to enhance learning. The features which include pre-testing, self-pacing, forced-response, and immediate feedback resulted in more efficient and more permanent learning (74). Programmed

instruction has made use of teaching machine equipment because it focused the learners attention of the significant points while he learned. After an item was answered correctly immediate confirmation was given and the learner proceeded confidently to the other items (76). Programmed instruction has a predetermined content and is not affected by instructor biases or experience; the quality of instruction does not vary. The materials can be used anywhere at any time and special facilities are not needed. Programs can be used without instructors; they are effective instructional materials even if an instructor is not present. This results from the testing and validation of the instructional material (74). Materials are pretested and modified until learners obtain high scores, which helped assure high levels of achievement when the program was distributed to learners. Good information retention was declared for programmed instruction (76).

Several disadvantages of the programmed instruction process have been identified. While there are a large number of programs available, many programs meet specific objectives which may not match with the local needs of the organization. Programs are expensive to develop due to the cost and time required to write, test, and validate the materials. Programs require

learners that are mature and motivated enough to work independently to complete the instruction (74).

This type of individualized learning, learner-controlled instruction (LCI), is being used for management training in several multi-unit lodging and foodservice companies is (78). LCI has been regarded as one of the most effective methods of training used and has been successfully applied to the hospitality industry to train management personnel. The use of LCI for non-management personnel has not been determined. However, adult learning theory indicates that LCI should be an appropriate approach for any group of learners (78). Forrest summarized the characteristics of LCI programs:

1. The trainee directs the learning process.
2. The learning outcomes are expressed in performance terms.
3. The program makes extensive use of "contract learning" techniques.
4. The learning environment is the actual job setting.
5. The learning activities are supported by printed materials and information.
6. Learning is indicated by demonstrated mastery under specified conditions.
7. Feedback on progress and performance is provided on an immediate and continuous basis.

8. The trainee controls the pace and sequence of learning activities.
9. The trainee may challenge and bypass learning activities leading to mastery of behaviors acquired in prior experiences. (78, page 111)

### Readability

If self-directed learning is to be effective, the learner must be able to read and comprehend the materials. Readability "is a term used to describe the relative ease or difficulty of printed narrative" (79, page 1). One method of expressing the difficulty is through the use of grade equivalents from grade one through seventeen. Readability formulae have been developed which "predict the difficulty of material for the reader at a given grade level" (79, page 1). Britton and Lumpkin computerized readability formulae (79). Benefits of computerization include speed and accuracy of computation, use of objective standards, printouts of unfamiliar words, and assessment of readability in various fields of study. Readability analyses can be used as technical manuals and instructional materials are being developed. This analysis is of benefit when addressing a target audience, such as foodservice managers. The recommended

test to use for instructional materials development is the Dale-Chall formula. The goal should be a reading level of no higher than twelfth grade (80).

Several readability formulae have been computerized and include Spache, Harris-Jacobson, Fry, Dale-Chall, and Flesch. The Dale-Chall formula was designed for middle school through adult material. This formula is "based on a word list and a factor of average sentence length" (79, page 5). It also has the most complicated rules for counting words and applying the formula.

#### Summary

The need for food tampering risk reduction programs for foodservice facilities is shown by the lack of published research. No published research literature about the risk of food tampering occurring at the level of the foodservice facility was found.

Literature describing the development and utilization of HACCP systems is increasing as this food protection model finds wider application at varying levels of production within the food processing industry. The apparent flexibility and adaptability of HACCP systems are evidenced by the incorporation of the approach throughout the food industry. As a systematic



approach to problem prevention, flexibility is needed to adapt HACCP systems to the uniqueness of operations. The HACCP system is not a static approach, rather it can be changed to meet changing or evolving technologies and situations. The HACCP system is a non-traditional approach to food safety.

The definitions of the HACCP system are changing and with broader definitions the approach can be incorporated into food protection programs. The traditional HACCP system used in food manufacturing is being reevaluated to extend its application to distribution, retail display, and time and temperature controls of food at home. Facility design evaluation has not been specifically included within the techniques to assess food safety in relation to food tampering risk reduction.

Instructional methods and materials for food tampering risk reduction education for foodservice managers have not been identified in the literature. Several instructional methods which rely upon self-administration by the learner have been described. A self-administered type of instructional program which does not require the presence of an instructor could be distributed to foodservice managers in numerous

locations. Such programs can be applied to the process of acquiring new knowledge, skills, and attitudes.

Hile has commented on the importance of the decisions made concerning tampering:

It is clear they realize that we will always have difficult choices to make; that we simply cannot protect consumers from every deranged person; that we must decide what protection can be offered and at what cost; that we must be prepared to give responsibility to the sector of society or government that is best able to respond; and that we must weigh what industry and government can do against what consumers themselves can do. (70, page 5)

## METHODOLOGY

### Overview

This research involved the study of food tampering within foodservice facilities. Foodservice managers' levels of awareness and perceived risk of food tampering were determined. The ability of foodservice managers to assess their foodservice facility in terms of food tampering risk and desire to take action to reduce risk was explored. The application of the HACCP system to food tampering risk reduction was investigated. This study was conducted with foodservice managers located across the United States.

This chapter is divided into four sections. The first section is an overview and introduces the study and research design. The second section defines the sample characteristics and selection process for Phase 1 and Phase 2. The development, testing, and administration of the instruments for both phases is described in section three. The final section identifies the evaluation of the study.

## Research design

The study used descriptive and experimental research techniques. The study was primarily exploratory since research in the area of food tampering risk reduction within foodservice facilities, such as restaurants, had not been published. The study consisted of two phases and data were collected in both phases. Figure 1 lists the steps in planning and conducting the study.

Three instruments were developed for use in the study. The first instrument, the survey questionnaire, was developed for Phase 1. This phase involved the descriptive part of the research and functioned to delineate the characteristics of the foodservice managers and the foodservice facilities which they represented (81). The questionnaire was used to demographically profile the managers, assess their opinions and awareness about food tampering, and profile the foodservice facilities.

Instruments two and three were developed for the second phase. Phase 2, the experimental portion of the study, used a post-test only control group design (82). The random sample was divided into experimental and control groups and the treatment and post-test were

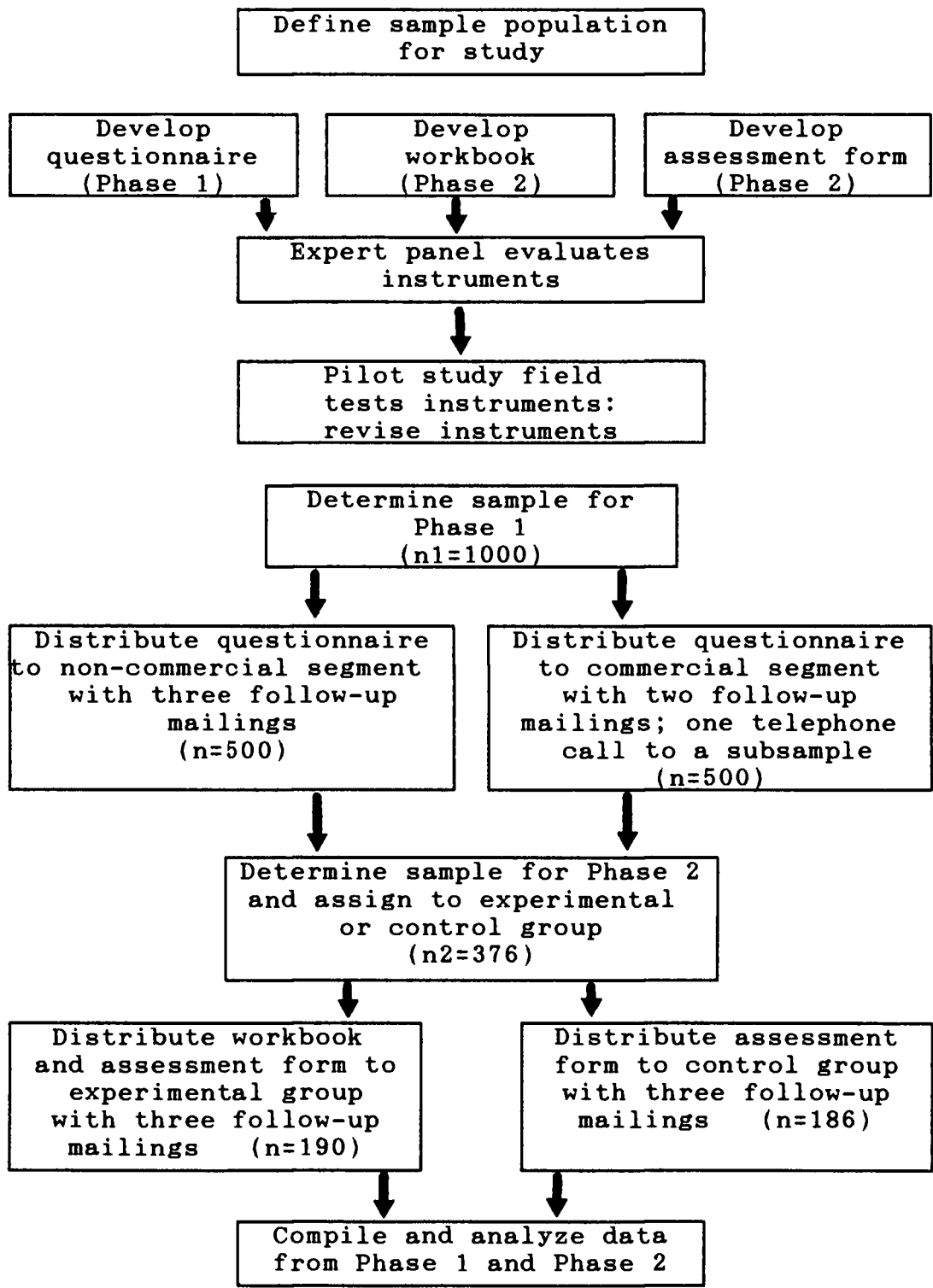


Figure. Steps in planning and conducting the study

administered. The second instrument developed for Phase 2 was a self-instructional food tampering risk reduction workbook. The workbook was based on principles of the Hazard Analysis Critical Control Point (HACCP) system (83) and developed using concepts of instructional manual design (72). The third instrument, a post-test, contained a food tampering hazard inspection form which was designed for the respondents to use to evaluate their facility in terms of food tampering risk. A set of questions paralleling questions posed in the Phase 1 questionnaire was also part of the post-test.

The independent variable was the food tampering risk reduction self-instructional workbook, the treatment tool, which was distributed to experimental group members. The dependent variables were changes in knowledge, opinions, and actions of the respondents as an effect of the application of the treatment tool. Variables of interest included 1) changes in the respondent's opinions and perceptions of food tampering risk; 2) the respondent's ability to apply modified HACCP principles to the operation of the foodservice facility; 3) the respondent's ability to recognize potential food tampering risk factors within their facility; and 4) the respondent's intent to take action to reduce risk within the facility.

Demographic variables for the foodservice facilities were used to profile the operations. Variables included status of the operation as contract or non-contract, commercial or non-commercial, and classification as restaurant, school, health care, industry, government other than school, transportation, or other type of foodservice. The size variable for the foodservice facility was estimated from the number of customers served each day. Other variables included the size of the city where the foodservice facility operated and rural or urban location.

Demographic variables for the foodservice managers included their source of food-related education, such as high school, community college, culinary arts, university, or on-the-job. The highest educational degree received by the respondents was determined and the major area of study for that degree.

#### Sample Characteristics and Selection

The population from which the sample was drawn was composed of managers of foodservice facilities located in the United States including Alaska and Hawaii. The foodservice facilities included both non-commercial and commercial organizations. The foodservice facilities or

managers were members of national foodservice organizations.

This study used the National Restaurant Association's (NRA) classification of foodservice operations as non-commercial and commercial. By this classification, the non-commercial foodservice facilities consisted of educational, business and industry, government, or institutional organizations which operated non-contract foodservices (84). Organizations which were part of this classification included hospitals, care facilities, governmental facilities, state institutions, schools and universities. Profit of the foodservice component of the organizations was not necessarily the primary objective of the operation. Rather, food might be served as part of the overall organization or as a convenience or subsidy to individuals such as employees, students, or patients. The commercial foodservice facilities were identified as establishments open to the public that operated for profit and supplied meal service (84). Both chain operations and single-unit foodservice facilities were included in the sample population. This included contract foodservice operations in non-commercial operations.



The sample size selected for Phase 1 was 1000 foodservice managers with an equal number from commercial and non-commercial foodservice facilities. This sample size was determined through consultation with the major professor for the study and based on the need for a large sample, yet reasonable in terms of resources and time. A large sample size was needed to represent the diversity of the foodservice industry. Due to the size of the foodservice industry, approximately 0.1% of the commercial and 0.3% of the non-commercial facilities were sampled. A national study was chosen so that possible regional differences would not have a large biasing effect on the outcome of the study. The sample was large so that if the response rate was low statistical analyses could still be performed.

#### Phase 1

The following sample selection process was used to identify 1000 foodservice managers as contacts for Phase I of the study. An equal number represented commercial (500) and non-commercial (500) foodservice facilities.

Sample source for commercial

Names were obtained from the National Restaurant Association (NRA) for both commercial and non-commercial classes of membership. The NRA was contacted by phone to request permission to use membership lists as the population for sampling. The Association requested a copy of the proposed questionnaire to review prior to release of the membership lists. After review, the NRA supplied a list of commercial members randomly generated by computer. The list identified 1000 names by the process of simple random sampling (85). Names were drawn from 14,000 members which comprised the 1991 commercial membership classification of the NRA.

The NRA was founded in 1919 and has approximately 20,000 members. The members are individuals who represent commercial and non-commercial foodservice organizations which include restaurants, cafeterias, clubs, contract foodservice management, drive-ins, caterers, institutional food services, and other members of the foodservice industry. The NRA represents its membership and non-affiliated state and local restaurant associations in governmental affairs. It sponsors annual foodservice conferences and food shows and publishes a monthly trade journal. The association has

a technical research division and maintains a 6000 volume library. The NRA supports foodservice education and research and develops and promotes educational programs for foodservice operators, food and equipment manufacturers, distributors and educators (86).

Sample source for non-commercial

The population from which the sample was drawn utilized the NRA and two other associations as sources of information. In 1991 the NRA had 410 non-commercial members which were identified in list form and supplied by the Association. These members represented schools, universities, hospitals, the military, and prisons. Membership rosters from two other foodservice associations whose membership represents non-commercial foodservice organizations were used: the National Association of College and University Food Services (NACUFS) and the American Society of Hospital Food Service Administrators (ASHFSA).

The NACUFS was founded in 1958 and has approximately 600 members. Membership includes foodservice operations in colleges or universities, residence halls or student centers. The association promotes high standards of service and food preparation

on campuses. NACUFS holds annual conventions and regularly publishes an annual journal, two quarterly newsletters, and a Professional Standards Manual. The organization provides information and assistance to members. Conferences, discussions, research, and publications are available for members (86).

The ASHFSA was founded in 1967 and has approximately 1800 members. Members are directors or assistant directors of foodservice departments of health care organizations. The society encourages continuing education and development of management skills leading to the improved administration of foodservice departments. ASHFSA holds annual conferences and publishes a quarterly newsletter, annual activities summary, and reference works on several topics relating to hospital foodservice including hospital foodservice systems planning (86).

#### Sample selection

Names on all lists were evaluated to determine if sample standards were met. Standards were that members had to be located in the United States, including Hawaii and Alaska, and have foodservice operations. Members not meeting these standards were excluded. (Members

without foodservices consisted of libraries or academic programs without foodservice operations; public health departments; and organizations with interest or business in the foodservice industry, such as food and wine associations, utilities, food producers and suppliers, and tourism organizations.

The commercial sample was selected from the NRA list of members who met standards. A table of random numbers (87) was used to identify a starting point for sample selection. Every other name was picked until a total of 500 names were selected.

The non-commercial lists for NACUFS and ASHFSA were compared to the NRA list to identify any duplication of membership. Names of NRA members who were also NACUFS or ASHFSA members were removed from the latter two lists.

The non-commercial sample was selected by drawing a proportional sample of members totalling 500 from the three amended membership lists. Numbers were as follows: NRA, 75 samples out of 410 members; NACUFS, 90 samples out of 487 members; ASHFSA, 335 samples out of 1800 members. A starting point for sampling each list was determined by a table of random numbers (87). Every fifth name was selected.

## Phase II

The Phase I questionnaires were evaluated for progression to Phase 2. Evaluation was made on the basis of whether or not the foodservice facility had self-serve foods as part of their operation. This decision was based on the respondent's answer to the question specifically asking if self-serve foods were offered. For the purpose of the study self-serve foods were defined as "foods or beverages which are selected and served by the customer". Self-serve foods were not commercially packaged, pre-wrapped by the foodservice facility, nor machine vended. The respondents who confirmed they offered those foods progressed to Phase 2; those without self-serve did not. A total of 376 respondents composed the population for Phase 2.

The respondents from Phase 1 which continued into Phase 2 (N=376) were divided into two groups, control (n=186) and experimental (n=190). To equalize representation, the qualifying respondents from the commercial and non-commercial facilities were alternately assigned into control and experimental groups. Assignment was done sequentially as responses to the Phase 1 questionnaires were received.

### Instrument Development

The following steps were used for the development, testing, distribution, and analysis of the three instruments: the questionnaire, food tampering risk reduction self-instructional workbook, and post-test with the food tapering hazard inspection form.

#### Questionnaire Development

The questionnaire was developed to provide information about the sample population, specifically, to assess the respondents' opinions and awareness of food tampering and risk reduction programs. Questions to obtain demographic data to describe further the respondents and the foodservice facilities they represented were also constructed.

The questionnaire was designed to collect two types of responses. The first type sought was dichotomous responses. The respondent selected between two finite answers to questions which helped to construct a demographic and awareness profile. The second type of responses sought used multiple choice questions. The questions were in the format of close-ended with ordered responses, close-ended with unordered responses, and

partially close-ended (88). These questions were used to gather opinions and awareness of food tampering.

The questionnaire was designed following Dillman's general conceptual model of survey questionnaires (88). The draft form was reviewed by the Oregon State Survey Research Center. Format changes were made to provide improved clarity and ease of completion. The questionnaire was submitted to Oregon State University Committee for Protection of Human Subjects on December 6, 1991. The committee reviewed and approved the instrument on January 13, 1992.

The questionnaire then had two additional evaluation and testing steps which resulted in a slight modification of the instrument. First the questionnaire was reviewed by an expert panel. It was subsequently field tested by a pilot study group. The expert panel and pilot study group are discussed in the section on Instrument Testing, pages 77-87.

Development of the Treatment:  
Food Tampering Risk Reduction Self-Instructional  
Workbook

This treatment tool was conceptually developed from the Hazard Analysis Critical Control Point (HACCP) system (83). The tool, formatted as a workbook, was



based on the seven principles of the HACCP system (53) as applied to the safe service of food, specifically safety of self-serve foods with respect to food tampering. A food safety program developed by the National Restaurant Association (NRA) was also used as a resource in the development of the workbook (89). This NRA program, the Sanitary Assessment of Food Environment (S.A.F.E.), was also based on HACCP principles, but application was made to restaurants. The S.A.F.E. program was designed for use by foodservice managers and personnel without extensive education or background in food microbiology. Risk factors within foodservice operations which might be linked to food tampering were identified, such as type of food served, processing required, handling and serving, facility design, and facility practices. Possible solutions to the risk factors included alternative means of serving food and floor plans designed to reduce the risk were presented. Contents included drawings and discussions of floor plans which could be used in service areas. Those examples assisted in the introduction of floor plan evaluation techniques for the foodservice managers' facilities leading to one type of food tampering risk assessment.

The following steps as outlined by Emerson (72) were used to develop the workbook:

1. The objectives of the program and the scope of the content were defined within the workbook.
2. The workbook was for the use of foodservice managers. The workbook was self-administered in a self-contained written unit. There was no outside study or pre-study required. The investigator was available by telephone, if needed.
3. The content of the workbook was determined through review of the literature.
4. The selected content focused the discussion of food tampering on self-serve foods.
5. The desired information was outlined to contain an introduction, presentation of materials, application, and practice section.
6. The format for the material was a narrative with self-test question.
7. The resource materials used for content format included the HACCP system and the National Restaurant Association's program called Sanitary Assessment of the Foodservice Environment (89).

8. The writing style was evaluated by the Dale-Chall (79) readability level testing at the high school graduate level.
9. The draft copy of the workbook was prepared.
10. Illustrations were added which consisted of computer-assisted drawing and design (AutoCAD, ver. 10, Autodesk, Incorporated) generated examples of floor plans. Clip art (WordPerfect, ver. 5.1, WordPerfect Corporation, Orem, UT) was included in the text and self-test sections.
11. The initial evaluation of the workbook was conducted by the Expert Panel and changes were made.
12. The revised workbook was pilot tested in the foodservice environment where it was to be used.
13. Final changes were made; type, paper and binding were selected; and the workbook was prepared for printing.

The criteria for developing the workbook included:

- a. The content was based on principles of the HACCP system.

- b. The text was written at the level of a high school graduate, eleventh to twelfth grade, as measured by a standard readability test.
- c. Foodservice managers with varying levels of knowledge of foodservice and skill in food sanitation and safety principles could use the workbook.
- d. The workbook could be read within a time period considered reasonable for foodservice managers: thirty minutes or less.
- e. The foodservice managers would have a document to serve as a future reference on food tampering.

The reading level of the notebook was tested by using the Dale-Chall readability test (79). An example of a tested section of workbook is located in Appendix A.

The workbook was evaluated by the expert panel and pilot study group as described in the section on Instrument Testing, pages 77-87. Suggestions were incorporated into the final workbook which was reproduced on eight and one-half inch by eleven inch paper with card stock cover. Left margin staple binding was used.

Development of the Post-test:  
Food Tampering Hazard Inspection Form

This instrument was the major source of data for the experimental portion of the study. The food tampering hazard inspection form was used by the experimental and control groups to evaluate their foodservice facilities with respect to factors associated with food tampering risk. A questionnaire section was used to gather information about the respondents' knowledge changes regarding principles of the HACCP system and application for food tampering risk reduction. This section also included questions related to the respondents' opinions of food tampering hazards and questions to determine any changes the respondents might make in response to the results of the food tampering hazard inspection. The post-test for the experimental group contained one additional question asking how much of the workbook the respondents had read. The final question for both groups was open-ended for further comment.

The food tampering hazard inspection form was developed for ease of use by the foodservice managers. The criteria for form development were:

- a. The questions were self-explanatory and the presence of the investigator on site was not required.
- b. The expected time required for completion of the inspection was minimized and estimated at less than thirty minutes.
- c. The process of the facility inspection followed the general principles of the Hazard Analysis Critical Control Point program.

The form was evaluated by the expert panel and pilot study group and was tested for validation in the pilot study group's facilities. Those processes are described in the Instrument Testing section, pages 85-87.

#### Instrument Testing: Expert Panel

##### Description of the Expert Panel

Expert panel members were chosen based on specific educational and experiential criteria. Criteria included experience in foodservice management or evaluation, or knowledge of the Hazard Analysis Critical Control Point system. All members were required to have earned a minimum of a Bachelor of Science or Arts degree

and to have a minimum of five years experience within their profession.

The investigator contacted prospective expert panel members by telephone. The purpose of the study, functions of the expert panel, and estimated time commitments and time lines were explained. Seven individuals agreed to be panel members but five completed the entire process. The distribution of the expert panel members follows. Three educators were from universities with nutrition and food management programs. Two food safety specialists knowledgeable in HACCP systems represented the public health perspective and were employed by public agencies, specifically a county health department and the Food and Drug Administration. They had education and regulation responsibilities for the foodservice industry. The two members who were not able to meet their initial commitment and complete the entire review process included an expert in HACCP systems from a food processing association and a director of technical service from a national organization representing foodservice facilities. The expert panel members are listed in Appendix B.

### Function of the Expert panel

The expert panel reviewed the questionnaire, workbook, and food tampering hazard inspection form. They assisted in validating the instruments and recommended modifications. The expert panel evaluated the instruments for appropriateness of the format, type of presentation, content, and fulfillment of the criteria stated for instrument development. Questions were developed to guide the evaluation of each instrument including the face and content validity (91). Additional questions developed by Dillman (88) were utilized to evaluate the questionnaire. The listings of the questions used are in Appendix B.

Questions relating to validity were used to determine what was actually being measured by the questionnaire. Face validity testing was conducted to determine if the questionnaire and facility assessment form appeared to measure the subject under consideration (82, 91). Content validity was concerned with the assessment device's ability to measure the constructs of the study. Content validity testing investigated the thoroughness, completeness of the device and whether or not the questionnaire covered the major dimensions and factors of the subject (82, 92).



The expert panel assessed the overall clarity of writing of the instruments and instructions for completing the questionnaire and the inspection form. The panel also evaluated instruments for ease of understanding, level of presentation, and applicability to the operations of foodservice facilities. Panel members contributed their perception of the time required to read and complete the questionnaire and workbook and to conduct the inspection using the form. The length of the instruments and time required for completion were estimated by the panel as to appropriateness for practical use within foodservice facilities. Open-ended questions asking for evaluation of the preceding criteria were provided to the expert panel members.

#### Procedure for Testing by the Expert Panel

A modified Delphi technique was used to evaluate the instruments. The first of the sequential steps followed was to mail a letter of introduction, draft copy of the instruments to be evaluated, and questions directing the evaluation to the expert panel members. Step two was a telephone conference call with panel members. For step three the panel members were mailed

revised instruments for subsequent evaluation. Finally, additional comments were discussed by a telephone call with each panel member. The time line used for the review process is summarized in Table 1.

Expert panel members were introduced to the study by mailing them an overview of the research including a statement of the problem and objectives. Explanation of the expert panel process used and listing of the expert panel members were included. They were provided a copy of the questionnaire, workbook, and the post-test with the food tampering hazard inspection form. Written responses from the expert panel regarding the instruments were retained by the panel for reference during a conference call. Each member's written comments were returned by mail following the conference call. A two week time frame was planned for this activity.

The telephone conference call was scheduled for two weeks after the expected receipt of the mailing by the panel. The conference call was participated in by two panel members, the investigator, and the initial major professor who discussed the instruments. The remaining panel members were unavailable due to illness or were out of town. Written documentation of the verbal responses or comments about the instruments was made at

the time of the conference.

Table 1  
Time line for the expert panel's review of the research instruments

Activity	Date
1. First mailing of draft instruments: questionnaire, workbook, facility assessment form and introductory letter with evaluation questions	11/22/1991
2. Conference call	12/13/1991
3. Second mailing of revised instruments with list of changes	12/26/1991
4. Individual calls to each panel member	1/13-16/1992
5. Letter of appreciation	1/28/1992

All panel members returned comments by mail. The panel members unable to participate in the conference call returned comments prior to or on the day of the call so that their input could be discussed during the conference. Members participating in the call returned written comments after the call. Several chose to return comments by facsimile prior to the call.

The verbal and written comments were reviewed, edited, and compiled. Comments from the conference call

and from returned responses were incorporated into the revised instruments.

The revised instruments were returned by mail to the panel two weeks after the conference call. A packet containing a cover letter, summary of suggested changes from written and verbal responses (Appendix B), and the revised instruments were sent to the expert panel for a second evaluation and opportunity for modification. The summary of evaluations contributed by the expert panel can be found in Appendix C.

Individual follow-up telephone calls were made to panel members two weeks after the expected receipt of the mailed revised instruments. The purpose of the calls was three-fold: first, to determine if the modifications to the instruments followed the intent of the member contributing the comment; secondly, to determine if changes improved the instrument; and thirdly, to determine if any additional changes or additions were indicated. The expert panel members had no further changes to recommend during the telephone calls. Therefore, no content changes were made in the instruments after the individual calls.

Letters thanking the expert panel members for their contribution to the study were mailed (Appendix B). This concluded formal involvement by the expert panel.

## Instrument Testing: Pilot Study

### Pilot Study Group Description and Function

A pilot study group was used to test the instruments before distribution to the sample. Potential pilot study participants were contacted by telephone to determine their willingness to participate in the study. The purpose of the study, function of the pilot study group, and time line were explained to individuals contacted. The six individuals who agreed to participate were selected from a population considered representative of the sample and included individuals from non-commercial and commercial foodservice facilities which offered self-serve foods to customers (93). Five of the six participants who were selected completed the pilot study. They represented one public school and two hospitals as non-commercial operations; one restaurant as the commercial operation; and one university residence facility as the contract operation within a non-commercial operation. The identification of the pilot study participants is listed in Appendix D.

### Procedure for Testing by the Pilot Study

The pilot study group participants were mailed or hand delivered packets which contained a letter of introduction that identified the study and the process to be followed (Appendix D). The questionnaire, food tampering risk reduction self-instructional workbook, and food tampering hazard inspection form were included in the packet.

The participants were asked to read the questionnaire cover letter and complete the questionnaire. Next, they were directed to read the workbook and complete the exercises. Their last task was to conduct a facility self-inspection using the form provided. A question sheet to direct their comments and provide space for writing accompanied the instruments. The pilot study group provided written documentation of their responses to the instruments on the sheets. They also responded by writing directly on the instruments.

Appointments were made with the pilot study participants and a meeting scheduled at their facilities within two weeks after they received the packet. The purpose of the meeting was to determine if they had questions about any parts of the instruments. During the meeting, they were asked questions to help assess

the clarity of instruments and the length of time needed for completion. All verbal comments were documented in writing. Comments were used as the basis for the modification of the instruments to improve the ability of the sample to complete the questionnaire, and to use the workbook and food tampering hazard inspection form (93). Information regarding the time commitment required by the pilot study group to complete the instruments was obtained.

Instrument Testing:  
Validation of the  
Food Tampering Hazard Inspection Form

The investigator visited the pilot study group participants and conducted on-site facility assessments within their foodservice facilities. These were scheduled after the facility assessments were completed by the pilot study participants to limit the amount of interference or possible bias which might be introduced by the investigator.

The purpose of the visits was to validate the food tampering hazard inspection form. Comparisons were made between the inspection forms completed by the pilot study and the same form completed by the investigator during the on-site visits to identify if comparable

evaluations were made. Comparisons between responses to the individual questions on the form and the final score of the facility assessment were made. The rate of agreement on questions was 91%. Out of 62 possible points, there was a difference of up to three points between the scores recorded by the pilot group participants and the investigator. While this format allowed for modification of the facility assessment form prior to distribution to the research sample, the results of the on-site visits indicated that no changes were needed.

#### Administration of Instruments

A mail survey format modelled after the Dillman method was used for the study (88). Instruments used in Phase 1 and Phase 2 were distributed by mail following those procedures. The questionnaire and the post-test were self-administered and completed by the respondents. The workbook was self-instructional. The projected desired level of response for the questionnaire and the post-test was 60%. Continued follow-up was made to maximize the percentage of participation (88). To eliminate or reduce low response rates which could introduce bias into the sample, non-respondents were



contacted by letter or telephone (94). Up to four contacts were made to obtain as great a response rate as possible. The response rate was determined by the following formula:

$$\text{Response rate} = \frac{(\text{number questionnaires returned})}{(\text{number in sample-number non-deliverable})} \times 100$$

### Phase 1

Phase 1 involved administration of the questionnaire to 1000 randomly selected managers of foodservice facilities. A copy of the questionnaire, cover letter, postcard, and follow-up letters are contained in Appendix E. The questionnaire was sent to the attention of the professional foodservice manager identified through the sample foodservice facility selection process, the name of the manager was used on the address whenever possible.

The method used for distribution and follow-up of the survey questionnaires followed Dillman's process for mail questionnaires (88). The process began March 1, 1992. The distribution process and schedule are shown in Table 2.

Table 2  
 Process and schedule for Phase 1 questionnaire  
 distribution and follow-up

Sequence for distribution and follow-up	Description of correspondence	Date
1. Mailing to all contacts: initial contact	Cover letter to describe study, questionnaire, and business reply envelope	3/1/92
2. Mailing to all contacts: postcard	Postcard thanked the respondents and reminded the non-respondents	3/8/92
3. Mailing to non-respondents only	Follow-up cover letter described importance of response, replacement questionnaire, and business reply envelope	3/22/92
4. Mailing to non-respondents in non-commercial group only	Follow-up cover letter emphasized response, replacement questionnaire, and business reply envelope	4/13/92
5. Telephone calls to a sample of non-respondents in commercial group only	Calls to determine reasons for low response rate of group	4/16/93

All contacts for Phase 1 were mailed the questionnaire and a brief cover letter introducing the study. A business reply postage-paid return envelope was included for the respondent's convenience and to

promote return of the questionnaire. An incentive for timely response was included with the initial mailing. Respondents had the option of entering a drawing for a one-hundred dollar cash award if their completed questionnaires were postmarked by March 15, 1992. The cash incentive was awarded to a respondent.

A postcard and cover letters were developed for each subsequent reminder mailing. The postcard reminder was sent to all contacts one week after the first mailing. The non-commercial segment of the sample received all three follow-up mailings, if needed. The commercial segment had a low response rate (37%) after two follow-up mailings. A phone-call interview replaced the final mailing in an effort to assess reasons for the low response rate. A random sample of 10% of the non-responders was selected. Those 32 non-responders were contacted by telephone and asked why they had not returned the questionnaires. The most frequent reasons for non-response were: contacts did not receive the questionnaire, too busy and didn't have time, the questionnaire was delegated to another individual and not completed, or they didn't think their response was important. No other information was obtained such as the size and location of their foodservice or

educational level. Table 3 summarizes the reasons for non-response collected during the telephone interviews.

The completed questionnaires were evaluated to determine which respondents had self-serve foods in their foodservice organization and would be progressing to Phase 2. Evaluation was conducted on the day that the questionnaires were received.

Table 3  
Summary of telephone follow-up calls to commercial non-respondents<sup>a</sup>

Reasons for non-response	Frequency
Did not receive/did not remember seeing questionnaire	9
Did not have time to complete	4
Did not know about questionnaire	4
Already returned questionnaire by mail	4
Did not want to participate	4
Delegated to another person	2
Left messages which were not answered or telephone listing had changed	5

<sup>a</sup>Phase 1; (n=32).

The overall response rate for Phase 1 was 54% (n=535): the non-commercial response rate was 71% (n=351); commercial, 37% (n=184).

Phase 1 respondents included both the commercial and non-commercial foodservice classifications and foodservice operations with and without self-serve foods. Of those usable responses (n=523), 34% were from commercial and 66% were from non-commercial foodservice operations. The number of responses from the non-commercial foodservice managers was nearly double the responses from commercial foodservice managers. Table 4 summarizes the response rate data for the Phase 1 questionnaire.

Table 4  
Response rate of the commercial and non-commercial groups, Phase 1

Questionnaires	Commercial	Non-commercial	Total
	No.	No.	No.
Mailed	500	500	1000
Non-deliverable	4	4	8
Returned responses	185	351	536
Response rate	% 37	% 71	% 54

Foodservice facilities with self-serve foods accounted for 72% of the total respondents in Phase 1; 27% of the foodservice facilities did not have self-serve; 1% of foodservice managers reported plans to add

self-serve foods. Table 5 summarizes the status of self-serve and no self-serve foodservice facilities and the number of questionnaires which were not usable. Usable questionnaires numbered 523. Questionnaires considered to be not usable failed to meet the criteria of the study. Those unusable included a military facility located outside the United States, organizations which did not have foodservices such as a library or foodservice association, and incompletely answered questionnaires.

Table 5  
Disposition of respondents with self-serve foodservice among the commercial and non-commercial foodservice facilities

Responses	Com <sup>a</sup> (n=185)		Non-com <sup>a</sup> (n=351)		Total (n=536)	
	No.	% <sup>b</sup>	No.	%	No.	%
No self-serve	111	60	28	8	139	26
Self-serve	70	38	316	90	386	72
Not usable	4	2	7	2	11	2

<sup>a</sup>Commercial and non-commercial respondents.

<sup>b</sup>Percent of responses.

## Phase 2

Phase 2 included the administration of the treatment which was the food tampering risk reduction

self-instructional workbook and the post-test which contained the food tampering hazard inspection form. The study was distributed by mail to the foodservice managers (n=376) identified through Phase 1 (Table 5). Procedures for the distribution and follow-up followed the general format described by Dillman (88) for survey mailings. The recommended time between mailings was extended to account for the mailing process. Due to the size of the Phase 2 packets and the number distributed, bulk mailing was used. Receipt of bulk mailing required more time than for the questionnaire of Phase 1. Also, it was anticipated that a longer time was needed for foodservice managers to complete the workbook and assessment form. Steps for the distribution and schedule of Phase 2 mailings are listed in Table 6.

Phase 2 included experimental and control groups. The members were not informed of their group assignment. The control group members were mailed the post-test. Those foodservice managers in the experimental group were mailed both the workbook and the post-test. A cover letter explaining the use of the inspection form within the post-test and instructions for completion of the form were included for both groups. The experimental group members were directed to first read the workbook, then to complete the inspection form.

Business reply postage-paid envelopes to return the post-test and form were included for the respondent's convenience. A copy of the cover letter, postcard, and follow-up letters, as well as the workbook and post-test are in Appendix F.

Table 6  
Process and schedule for Phase 2 instrument distribution and follow-up

Sequence for distribution and follow-up	Description of correspondence	Date
1. Mailing to Control group:	Cover letter, form, business reply envelope	5/21/92
Experimental group:	Cover letter, workbook, form, business reply envelope	
2. Mailing to all contacts: Control and Experimental	Postcard thanked the respondents and reminded the non-respondents	6/4/92
3. Mailing to non-respondents only: Control and Experimental	Follow-up cover letter described importance of response, replacement form, and business reply envelope	6/25/92
4. Mailing to non-respondents only: Control and Experimental	Follow-up cover letter emphasized response, replacement form, and business reply envelope	7/24/92



Respondents in the experimental group were asked to keep the workbook as a possible reference for their organization and as a thank you for participation. A second copy of the food tampering hazard inspection form was included for the experimental and control groups to use as a reference.

The experimental group numbered 190 and the control group, 186. Both groups were represented by foodservice managers from commercial and non-commercial foodservice facilities. The overall response rate for Phase 2 was 66% (n=249): the experimental group response rate was 62% (n=118); control group, 66% (n=122). In both the experimental and control groups, responses were higher for the non-commercial than the commercial foodservice managers. This information is listed in Table 7. In all, there were 11 responses which could not be used because they were incomplete or not identifiable. The number of usable responses was 238.

Table 7  
Response rate of the experimental and control groups,  
Phase 2

Phase 2 groups (n=376)	Sample number No.	Number of responses No.	Response rate %
Experimental	190	118	62
commercial	31	15	48
non-commercial	159	103	65
Control	186	122	66
commercial	31	18	58
non-commercial	155	104 <sup>a</sup>	67
Experimental and Control total response	376	249 <sup>b</sup>	66

<sup>a</sup>Includes 2 unusable responses.

<sup>b</sup>Includes 9 unusable responses due to the return of  
uncoded copies of post-test

### Data Analyses

Data were analyzed by computer-assisted statistical analysis (SPSS/PC+. ver. 4.0. SPSS Incorporated, Chicago, Il). The level of significance for testing was established at  $p \leq .05$ . Data from the questionnaire provided information about the sample population; quantitative descriptions of population characteristics were determined (95). Questions also

examined the relationship between variables (95) such as demographic data and the possible influence on the respondents' opinions related to food tampering. Descriptive data were analyzed by calculating percentages from participant responses to items in the questionnaire.

Chi square, a correlation coefficient, was used to compare measurements on two or more variables to determine the degree of relationship between the variables (95). The experimental and control groups were measured on the dependent variables and scores compared. For example, comparisons were made between demographic factors, such as the size of the foodservice facility and opinions about food tampering awareness.

The t-test was used to contrast data gathered on the food tampering hazard inspection forms for both the control and experimental groups. This parametric statistic was used to determine if correlated means between two groups were significantly different (81). The workbook was evaluated through comparisons of the control and experimental respondents' performance on the post-test. Responses to the inspection forms were compared for the experimental and control groups.

## RESULTS AND DISCUSSION

The reporting of results will be as follows. Results from Phase 1 of the study will be presented first. Descriptive information about the respondents and the foodservice facilities they represented are provided in the form of frequencies from the questionnaire responses. Categorical data, which included demographic variables for the respondents and their facilities, were analyzed using Chi square.

Results of Phase 2, the experimental portion of the study, follow the Phase 1 section. Data were statistically analyzed using Chi square and the t-test. Eleven null hypotheses were tested. Seven of the eleven null hypotheses relating to the use of the treatment (self-instructional workbook) and the post-test (food tampering hazard inspection form plus questionnaire) of Phase 2 are discussed. The remaining four null hypotheses will be discussed which are based on changes, if any, which occurred in respondents after participation in Phase 2 of the study. Data were analyzed by the Chi square and t-test.

### Results and Discussion of Phase 1

The purpose of the Phase 1 questionnaire was twofold. One objective was to identify the population for Phase 2 of the study. The other objective was to obtain descriptive data to provide a profile of the foodservice managers and foodservice facilities represented and to characterize the managers' awareness and opinions about food tampering. Data also served as a baseline for comparison to Phase 2 responses. Demographic data related to the participants will be presented first, then foodservice facilities information. Data about the managers' opinions, awareness, and actions concerning food tampering follow. The data were grouped in three ways to characterize and compare the sample: total of all respondents, respondents from commercial and non-commercial foodservice facilities, and respondents from foodservice facilities with and without self-serve foods.

#### Demographic Data

The Phase 1 questionnaire was mailed to 1000 foodservice managers in the United States. Participants were randomly selected from two classifications of

foodservice operations, commercial and non-commercial, to obtain a sample representing different aspects of the industry. There were five hundred commercial and 500 non-commercial participants. The combined response rate for Phase 1 was 54%; the commercial group was 37%, and the non-commercial group, 71%. The commercial group returned 185 responses and the non-commercial group, 351.

Information was sought about the educational background of the respondents. Table 8 summarizes the source of respondents' (n=519) foodservice-related education. Fifty-three percent (n=274) of the total respondents obtained this education from college; 36% (n=189) had on-the-job foodservice-related education. The added percentages of those receiving foodservice-related education from high school, community or junior college, and culinary arts college totaled 11% (n=56). The respondents were asked to choose only one response so this information is closely related to that in Table 9. Undoubtedly all respondents experienced on-the-job education, formal and/or informal, as they worked in the foodservice organization.

There was a significant difference between the commercial and non-commercial groups and their source of foodservice-related education ( $p=.00$ ). Seventy-one

percent of participants who received on-the-job foodservice education were in commercial foodservices; 29% in non-commercial. Ten percent of the community and junior college respondents and 10% of college and university respondents represented commercial foodservices. Fifty percent of the culinary arts respondents were in each segment of the industry.

Table 8  
Source of commercial and non-commercial foodservice respondents' foodservice-related education

Foodservice-related education	Com <sup>a</sup> (n=178)		Non-com <sup>a</sup> (n=341)		Total <sup>b</sup> (n=519)
	No.	%	No.	%	%
High school	1	<1	0	0	<1
Community/junior college	3	2	28	8	6
Culinary arts college	12	7	12	4	5
College/university	28	16	246	72	53
On-the-job	134	75	55	16	36

<sup>a</sup>Respondents from commercial and non-commercial foodservice classifications.

<sup>b</sup>Percent of total commercial and non-commercial respondents.

<sup>c</sup>Significant difference between commercial and non-commercial groups with respect to the source of foodservice-related education ( $p < .05$ ).

The respondents (n=515) identified the highest educational degree received. Bachelor of arts or science or higher degrees were held by 67% (n=347). Those with high school, associate, and certificate degrees accounted for 30% (n=156). Twelve respondents indicated other degrees or professional attainment which included Master of Arts or Science, Master of Business Administration, Master of Public Health, Doctor of Philosophy, Chef, and Registered Dietitian. Table 9 summarizes the highest educational degree received by the respondents.

There was a significant difference between the commercial and non-commercial groups' in the highest educational degree received ( $p=.00$ ). Forty-four percent of the commercial and 80% of the non-commercial respondents had bachelor or higher degrees; 34% of commercial and 4% of the non-commercial had high school diplomas as their highest level of education. Differences may be due in part to different job requirements and hiring practices of the commercial and non-commercial foodservice organizations. However, in comparing the highest educational degree data with the source of foodservice-related education, it can also be concluded that many had received educational degrees unrelated to the foodservice field.



Table 9  
Highest educational degree received by commercial and non-commercial foodservice respondents

Educational degree	Com <sup>a</sup> (n=176)		Non-com <sup>a</sup> (n=339)		Total <sup>b</sup> (n= 515)
	No.	%	No.	%	%
High school	59	34	15	4	14
Associate	18	10	35	10	10
Certificate	12	7	17	5	6
Bachelor's or higher	77	44	270	80	67
Other	10	6	2	1	2

<sup>a</sup>Respondents from commercial and non-commercial foodservice classifications.

<sup>b</sup>Percent of total commercial and non-commercial respondents.

<sup>†</sup>Significant difference between the commercial and noncommercial respondents with respect to the highest educational degree they received ( $p < .05$ ).

The major areas of study for the respondents' (n=364) degree are listed in Table 10. The largest percentage (41%) of combined commercial and non-commercial responses was dietetics, nutrition, or biochemistry as the major area of study; 22% studied food management, institution management, or hospitality management; 20% listed business. The biological and natural science areas were represented by 3%, while liberal arts accounted for 10%. Culinary arts were reported by 4%.

There was a significant difference between the commercial and non-commercial respondents in their major area of study ( $p=.00$ ). Ninety-seven percent of those who studied dietetics were employed in non-commercial foodservices; 84% who studied food management were employed in the non-commercial segment of the industry; 51% of business students were in commercial; 58% of biology majors were in commercial; and 75% of liberal arts and 62% of culinary arts were in the commercial sector.

Table 10  
Area of study of commercial and non-commercial foodservice respondents<sup>†</sup>

Area of study	Com <sup>a</sup> (n=99)		Non-com <sup>a</sup> (n=265)		Total <sup>b</sup> (n=364)
	No.	%	No.	%	%
Dietetics	4	4	145	55	41
Food mgmt.	13	13	66	25	22
Business	37	37	35	13	20
Biology	7	7	5	2	3
Liberal arts	27	27	9	3	10
Culinary arts	8	8	5	2	4
Other	3	3	0	0	<1

<sup>a</sup> Respondents from commercial and non-commercial foodservice classifications.

<sup>b</sup> Percent of total commercial and non-commercial respondents.

<sup>†</sup> Significant difference between the areas studied for the commercial and non-commercial respondents ( $p<.05$ ).

Respondents (n=517) were asked their title to discover the type of positions they held within the foodservice organization. There was a significant difference between the position titles reported by commercial and non-commercial respondents. For the combined sample of commercial and non-commercial respondents, the largest number (n=373) were managers or directors, which comprised 72% of the respondents. Twenty-five percent (n=45) of the commercial and 97% (n=328) of the non-commercial participants were managers or directors. In contrast, 16% (n=82) of the participants were owners of organizations; 46% (n=81) of the commercial and less than 1% of the non-commercial respondents. Results are listed in Table 11.

The number of non-commercial contacts who returned the questionnaire was nearly double that of the commercial. Perhaps the significant differences between the commercial and non-commercial respondents in the areas of source of food-related education, level of education, and area of study influenced the return rate. A higher percentage of the non-commercial managers had a minimum of a Bachelor of Arts or Science degree than the commercial managers, 80% and 44%, respectively. These managers may have been more supportive of educational

and research efforts because of their greater experience with academic activities.

Table 11  
Position titles of commercial and non-commercial foodservice respondents

Title	Com <sup>a</sup>		Non-com <sup>a</sup>		Total <sup>b</sup>
	(n=178)		(n=339)		(n=517)
	No.	%	No.	%	%
Manager or director	45	25	328	97	72
Corporate officer	44	25	2	<1	9
Owner	81	46	1	<1	16
Chef	6	3	1	<1	1
Other	2	1	7	2	2

<sup>a</sup> Respondents from commercial and non-commercial foodservice classifications.

<sup>b</sup> Percent of total commercial and non-commercial respondents.

<sup>c</sup> Significant difference between the commercial and non-commercial foodservice respondents with respect to position titles ( $p < .05$ ).

Additional demographic information was obtained about the respondents and the foodservices they represented. Eighty-nine percent of the total respondents (n=509) classified their foodservice operation as "non-contract". Ninety percent of the commercial respondents and 88% of the non-commercial respondents were from non-contract foodservice

operations. Those foodservices were managed through the company which housed them and included most of the hospitals, schools, and restaurants in the study. Only 11% (n=57) were "contract", managed by food management companies outside of the organization housing the foodservice. Three percent of the contract foodservices were reported by participants in the commercial group and 8% were in the non-commercial. The difference between contract and non-contract foodservices in the commercial and non-commercial sectors was not significant.

Respondents described the nature of their operation using the categories of restaurant, school, health care, industry, government other than school, transportation, and other. The greatest percentage (44%) of combined commercial and non-commercial respondents represented health care organizations. The second largest group were from restaurants, 29%; followed by schools, 17%. The remaining 4% were in industry and government. No participant reported foodservice within the transportation category. There was a significant difference between the commercial and non-commercial groups and the foodservice facility type represented ( $p=.00$ ). Eighty-one percent of commercial respondents were managers of restaurants; 66% of non-commercial

managers were from health care facilities. Information is summarized in Table 12.

Table 12  
Commercial and non-commercial foodservice respondents' description of the foodservice facility type they represented<sup>†</sup>

Description of foodservice	Com <sup>a</sup> (n=179)		Non-com <sup>a</sup> (n=342)		Total <sup>b</sup> (n=521)
	No.	%	No.	%	%
Restaurant	145	81	5	2	29
School	3	2	86	25	17
Health care	1	<1	227	66	44
Industry	4	2	1	<1	1
Government	1	<1	16	5	3
Transportation	0	0	0	0	0
Other	25	14	7	2	6

<sup>a</sup>Respondents from commercial and non-commercial foodservice classifications.

<sup>b</sup>Percent of total commercial and non-commercial respondents.

<sup>†</sup>Significant difference between the commercial and non-commercial foodservice respondents with respect to the facility types they represented ( $p < .05$ ).

The population demographics of the sample were investigated to see if differences existed between respondents. Did the population of the area or perception of rural or urban location influence responses? Three questions (Appendix E: question

numbers 15, 16, and 17) were used. The size of the area where the foodservice facility was located was recorded by respondents by estimating the population of the city or town where their foodservice was located. The question (Appendix E, question number 16) was, "Please estimate the population of the city/town where your foodservice is located: 1. less than 10,000; 2. 10,001 to 50,000; 3. 50,001 to 100,000; 4. 100,001 to 500,000; 5. larger than 500,000." Forty-three percent (n=217) of the combined commercial and non-commercial respondents indicated a population size of less than 10,000 to 50,000; 32% (n=163) reported a population of 50,001 to 500,000. The remaining 25% (n=129) indicated populations greater than 500,001. The results are shown in Table 13. There was a significant difference between the commercial and non-commercial participants and the estimated population where their foodservice facility was located ( $p=.00$ ). The commercial foodservice operations were in smaller communities; 54% were in cities with a population of 50,000 or less.

Participants were asked, "Do you consider your foodservice facility to be located in a rural or urban area: 1. rural; 2. urban." Of the total combined commercial and non-commercial respondents, 39% (n=201) considered their foodservice facility to be located in a

rural area. The majority, 61% (n=316), regarded the location as urban. There was no significant difference between commercial and non-commercial groups in the rural or urban location of their foodservice facility.

Table 13  
Estimated population of the city/town where the commercial and non-commercial respondent's foodservice was located<sup>c</sup>

Population	Com <sup>a</sup> (n=173)		Non-com <sup>a</sup> (n=336)		Total <sup>b</sup> (n=509)
	No.	%	No.	%	%
<10,000	49	28	34	10	16
10,001-50,000	42	24	92	27	26
50,001-100,000	22	13	58	17	16
100,001-500,000	23	13	60	18	16
>500,000	37	21	92	27	25

<sup>a</sup> Respondents from commercial and non-commercial foodservice classifications

<sup>b</sup> Percent of total commercial and non-commercial respondents.

<sup>c</sup> Significant difference between the commercial and non-commercial foodservice facilities with respect to the size of the city (p<.05).

The third question was designed to get information about the size of the foodservice facility as expressed by numbers of customers or covers served each day. The question was, "Please estimate the number of customers/covers you serve each day: 1. 100 or less;



2. 101 to 500; 3. 501 to 1000; 4. over 1001. The number of respondents was 516. The smallest size category, less than 100 customers served per day, was represented by 11% of respondents; those serving 101 to 500 comprised 34% of the sample; 17% of the respondents were employed in facilities serving 501 to 1000 meals. The largest volume foodservices, serving over 1001 meals, were represented by 38% of total respondents; 8% of the commercial and 54% of non-commercial participants. Seventy-nine percent of commercial foodservices served 500 or fewer customers per day while 74% of the non-commercial served more than 500 customers. There was a significant difference between the number of customers served by the commercial and non-commercial classification ( $p=.00$ ). The foodservice facility size data are summarized in Table 14.

Table 14  
 Size of foodservice facilities by commercial and non-commercial foodservice respondents' estimation of customers/covers served each day<sup>f</sup>

Customers per day	Com <sup>a</sup> (n=178)		Non-com <sup>a</sup> (n=338)		Total <sup>b</sup>
	No.	%	No.	%	%
100 or less	44	25	12	4	11
101 to 500	97	55	76	23	34
501 to 1000	22	12	68	20	17
over 1001	15	8	182	54	38

<sup>a</sup>Respondents from commercial and non-commercial foodservice classifications.

<sup>b</sup>Percent of total commercial and non-commercial respondents.

<sup>f</sup>Significant difference between the commercial and non-commercial type of operation with respect to the size of the facility ( $p < .05$ ).

Since the major area of interest for food sabotage reduction was the self-serve food areas of foodservice facilities, participants were asked if their foodservice offered self-serve foods. Positive responses identified the sample for Phase 2, which was composed of only managers of commercial and non-commercial foodservices with self-serve foods. Table 15 identifies the distribution of self-serve foods among the respondents. Seventy-two percent of the respondents had self-serve foods (n=376), 1% (n=4) planned to add self-serve, and 27% (n=142) did not have self-serve foods. There was a

significant difference between commercial and non-commercial respondents with respect to the use of self-serve foods. Thirty-three percent of the commercial foodservice facilities had self-serve; 91% of the non-commercial used the self-serve style of food service.

Table 15

Use of self-serve foods among commercial and non-commercial respondents<sup>†</sup>

Use of self-serve foods	Com <sup>a</sup> (n=179)		Non-com <sup>a</sup> (n=343)		Total <sup>b</sup>
	No.	%	No.	%	%
No	114	64	28	8	27
Plan to	1	<1	3	1	1
Yes	64	36	312	91	72

<sup>a</sup>Respondents from commercial and non-commercial foodservice classifications.

<sup>b</sup>Percent of total commercial and non-commercial respondents.

<sup>†</sup>Significant difference between the commercial and non-commercial groups with respect to the use of self-serve foods ( $p < .05$ ).

Respondents with self-serve foods were asked to identify the type by selecting as many of the seven classifications as applied to their operation. Results are listed in Table 16. Significant differences were noted between the commercial and non-commercial groups in their use of cafeteria style self-serve, salad bars, and dessert bars. The largest number of respondents in

both groups used salad bars. The "beverage only" classification was incorrectly interpreted by respondents as evidenced by the numbers of responses to the remaining six classifications. This was intended to be exclusive: if 205 served only beverages as their entire self-serve offerings, then 107 would be the largest number of respondents in any other classification.

Table 16  
Commercial and non-commercial foodservice respondents' descriptions of types of self-serve within their foodservice operation

Types of self-serve	Com <sup>a</sup> (n=64)		Non-com <sup>a</sup> (n=312)		Total <sup>b</sup> (n=376)
	No.	%	No.	%	%
Cafeteria style	14	36	195 <sup>†</sup>	77	56
Salad bar	48	89	298 <sup>†</sup>	97	92
Pasta bar	9	27	87	44	26
Dessert bar	22	55	184 <sup>†</sup>	76	55
Hot/cold buffet	37	76	161	72	53
Bowl of snacks	19	50	82	42	27
Beverages only	13	41	205	86	58
Other	13	54	50	59	17

<sup>a</sup>Respondents from commercial and non-commercial foodservice classifications.

<sup>b</sup>Percent of 'yes' responses from total number of responses (n=376); respondents could select more than one classification.

<sup>†</sup>Significant differences between the commercial and non-commercial respondents (p<.05).

### Opinions, awareness, and concerns

The level of awareness of food tampering among foodservice managers was explored. This was an effort to find out if food tampering information from the media or from their trade organizations is reaching the managers. Awareness may also contribute to managers' opinions and concerns about food tampering. Results of the questions which sought to describe the awareness, opinions, and concern of participants follow.

The majority (>50%) of combined commercial and non-commercial foodservice managers in the sample were not aware of food tampering. Three questions (Appendix E: question numbers 1, 3, 12) were used to determine food tampering awareness. The questionnaire was formatted so that questions relating to the foodservice manager's opinions of food tampering initially were general and then increased specifically to the organization represented. The first question was designed to be answerable by all and was non-discriminatory (88). This was, "During the past 12 months, how much have you read or heard of the issues surrounding food tampering happening in foodservice facilities: 1. a lot; 2. some; 3. nothing". The purpose of the question was to estimate the level of food tampering awareness of

foodservice managers (n=522). Two percent (n=11) reported hearing "a lot", 48% (n=251) heard "some", and 50% (n=260) heard "nothing". There was no significant difference between the amount heard or read about food tampering by the commercial and non-commercial participants (p=.58).

Question number three asked, "To your knowledge, has food tampering in foodservices occurred in the city or town where your foodservice is located: 1. yes, for certain; 2. yes, suspected; 3. no, do not know." Of the 520 respondents, 6% (n=30) reported "yes, for certain"; 8% (n=40) "yes, suspected"; 57% (n=289) "no"; and 31% (n=161) "did not know". Therefore, 14% knew of food tampering incidence or suspected food tampering within their geographic area. There was a significant difference between the commercial and non-commercial groups' knowledge of food tampering occurring in foodservices in the town where their foodservice was located (p=.02).

Question number twelve, the most direct question posed, was, "To your knowledge, has food tampering occurred in your foodservice facility: 1. yes, for certain; 2. yes, suspected; 3. no; 4. do not know." Of the respondents (n=519), 8% (n=43) "were certain, or suspected"; 86% (n=445) responded "no"; and 6% (n=31)

"didn't know". There was a significant difference between commercial and non-commercial groups' knowledge of food tampering occurring in their foodservice facility ( $p=.00$ )

One-half of the food managers in the sample had neither heard nor read about food tampering in the past year and expressed low awareness. The lack of communication and media interest or coverage, or the managers' lack of interest could have contributed to the findings. Food tampering has not been brought to the attention of food managers and the subject is not well documented nor communicated within the industry. The low awareness level was consistent with the investigator's discussion of food tampering with a representative of a national association. In a telephone conversation (96), it was reported that the association and government officials agreed not to publish information about the topic for fear of copy-cat food tampering.

The majority (>50%) of combined commercial and non-commercial foodservice managers expressed some concern about food tampering occurring within their foodservice organization. However, there was a significant difference between respondents with and without self-serve in concern for the possibility of food tampering

occurring in their facility ( $p=.02$ ). Greater levels of concern were expressed, "very " and "somewhat", by the respondents with self-serve foods than without this type of service, 73% and 63%, respectively.

Two questions (Appendix E: question numbers 2,4) considered the foodservice managers' opinions of food tampering risk and their level of concern. Question number two asked, "In your opinion, what is the risk of food tampering occurring in any type of foodservice facility (such as restaurants, schools, clubs, hospitals) through the United States: 1. high risk; 2. low risk; 3. no risk." Of the 515 combined commercial and non-commercial respondents, 32% ( $n=166$ ) reported "high risk"; 65% ( $n=336$ ) "low risk"; and 3% ( $n=13$ ) "no risk". Question number four (Appendix E) was, "Generally, how concerned are you about the possibility of food tampering in your facility: 1. very concerned; 2. somewhat concerned; 3. not at all concerned." Fifteen percent ( $n=78$ ) of the combined commercial and non-commercial managers ( $n=520$ ) were "very concerned"; 55% ( $n=286$ ) were "somewhat concerned"; and 30% ( $n=156$ ) were "not at all concerned".

Although 50% had not heard or read of food tampering in the past year, 70% expressed a level of concern about the possibility of food tampering in their



foodservice facility. The questionnaire introduced some participants to food tampering and may have increased their concern.

Differences between the commercial and non-commercial respondents and their opinions of concern and risk of food tampering were sought. Two questions (Appendix E: question numbers 2, 4) were used for Chi square analysis of the responses of the commercial and non-commercial groups. There was a significant difference between commercial and non-commercial respondents in the expression of the risk of food tampering occurring in any type of foodservice facility in the United States ( $p=.01$ ). Also, there was a significant difference between commercial and non-commercial groups' concern about the possibility of food tampering occurring in their facility ( $p=.00$ ).

The commercial and non-commercial groups were combined for analysis to determine if there was a relationship between the amount participants had heard or read about food tampering and their level of concern. Responses to the Phase 1 question numbers one and four were analyzed by Chi square. There was a significant relationship between the amount heard or read by the participants and concern for the possibility of food tampering happening in their facility ( $p=.00$ ). Thirty-

eight percent of the respondents who had heard "nothing" were "not at all concerned"; no respondents who had heard "a lot" were "not at all concerned". Fifty-five percent who heard "a lot" were "very" concerned; only 12% who heard "nothing" were "very" concerned. However, only 2% of the respondents had heard "a lot", and 50% "heard nothing". The majority (61%) of respondents who heard "some" were "somewhat" concerned.

Was there a relationship between the education of respondents and food tampering concern expressed? The combined responses of the commercial and non-commercial group to three questions were the source of data (Appendix E: question numbers 4, 18, 19). There was no significant relationship with the educational level of managers and their concern for food tampering occurring in their facilities ( $p=.06$ ). However, this value approached significance. Fifty-seven percent of the respondents who indicated a concern level of "very," or "somewhat" reported "high school" as their highest educational degree; 72% expressing the same concern reported "bachelor of arts, science, or higher" degrees. Respondents with high school diplomas had the largest percentage of responses in the "not at all" concerned category at 43%; the same level of concern was expressed by 29% with bachelor or higher degrees; 28% with

certificates; 23% with associate degrees. Generally, respondents who had more education expressed greater concern.

There was a significant difference between the respondent's source of foodservice education and concern for food tampering in their facility ( $p=.01$ ). Of the respondents who were "not at all concerned", 21% received foodservice-related education in community or junior college; 21% in the culinary arts; 27% in the college and university; and 37% on-the-job. The on-the-job group had the highest percentage, 20%, for "very" concerned, and lowest percentage, 43%, for "somewhat" concerned.

Data were analyzed to determine the level of concern for food tampering between participants with and without self-serve foods (Table 17). There was a significant difference between the level of concern for food tampering in respondents' facilities and the use or absence of self-serve food service ( $p=.02$ ). Respondents with self-serve foods expressed greater concern than those without self-serve.

The possible relationship of respondents' concern and perceived risk of food tampering with the size and location of foodservice facilities was explored. Responses to two questions (Appendix E: question numbers

4, 17) were analyzed; commercial and non-commercial groups were combined. There was a significant difference between the size of the facility expressed as customers per day and the respondent's concern for the possibility of food tampering in their facility ( $p=.00$ ). The percentage of respondents who answered "not at all", in response to concern, decreased with each increase in facility size, from 48% at size less than 100 to 21% at over 1000 customers. The percentage of respondents answering "somewhat" concerned increased with each increase in facility size, from 39% at less than 100 customers, to 66% over 1000. The percentage for "very concerned" varied from 13% to 17%.

Table 17

Food tampering concern expressed by commercial and non-commercial foodservice respondents with and without self-serve foods<sup>†</sup>

Level of concern	No self-serve <sup>‡</sup> (n=146)		Self-serve <sup>‡</sup> (n=373)	
	No.	%	No.	%
Very	26	18	51	14
Somewhat	66	45	220	59
Not at all	54	37	102	27

<sup>‡</sup>Commercial and non-commercial respondents were combined.

<sup>†</sup>Significant difference in the level of food tampering concern expressed by respondents with and without self-serve foods ( $p<.05$ ).

Data were examined to find out if the location of the foodservice related to respondents' perceived risk of food tampering. The question that asked respondents' opinion of location, rural or urban, was cross-tabulated with concern expressed for food tampering in their facility (Appendix E: question numbers 4, 15). Sixty-three percent of participants who classified themselves as "rural" expressed their concern level as "very," or "somewhat"; 74% of "urban" expressed that level of concern. There was a significant difference between urban and rural foodservice location in the respondents' concern for food tampering in their facility ( $p=.01$ ).

Another area of interest was to determine if the respondents used HACCP systems in their foodservice facilities. The Hazard Analysis Critical Control Point program is a system to identify, evaluate, and monitor food quality and safety throughout production. HACCP traditionally has been used in food production and processing facilities. Recently, HACCP has been introduced into some foodservice facilities for food safety purposes. Two questions (Appendix E: question numbers 5, 6) were used to gather HACCP and in-house inspection information. The purpose of question five was to determine to what extent the HACCP principles had been integrated into foodservice facility programs in

the sample. It was found that the majority (>50%) of foodservice managers do not use self-inspection based on HACCP principles as part of a food safety program. Question five asked, "Do you, or does your company, use the Sanitary Assessment of Foodservice Environment (S.A.F.E.) or Hazard Analysis Critical Control Point (HACCP) program: 1. yes; 2. no; 3. do not know." Of respondents (n=514), 19% (n=98) reported "yes", they used such a program; 69% (n=353) "did not"; and 12% (n=63) "did not know". Those findings may indicate that the HACCP system has not been extensively used yet within the sample populations' segment of the food industry. It may have been that those managers did not have enough knowledge of the HACCP system to recognize if it was a foundation of their programs.

Commercial and non-commercial respondents were compared as to their use of HACCP programs and in-house inspections. Two questions (Appendix E: question numbers 5, 6) were cross-tabulated using Chi square analysis. There was no significant difference between the commercial and non-commercial groups' use of HACCP or S.A.F.E. programs ( $p=.39$ ). Sixteen percent of the commercial and 21% of the non-commercial respondents used a HACCP-based program. Most likely, the commercial respondents, who were members of the National Restaurant

Association (NRA), used the S.A.F.E. program which was developed by the NRA. However, respondents were not asked to name the program used.

However, the majority of respondents did use in-house inspections. Question six was, "Do you, or does your company, use in-house inspection programs: 1. don't know; 2. no; 3. yes, use." Of the 518 responses, 82% (n=425) reported using in-house inspection programs; 16% (n=83) "did not"; and 2% (n=10) "didn't know". There was no significant difference between the commercial and non-commercial groups' use of in-house inspection programs ( $p=.09$ ). Seventy-seven percent of the commercial and 85% of the non-commercial reported using in-house inspections. This majority of response may indicate a group of participants who routinely monitor their operations and place value on prevention through identification of problems. Most facilities used more than one type of in-house inspection. The types of in-house inspection programs are summarized in Table 18.

Table 18  
 Classification of in-house inspection programs used by  
 commercial and non-commercial respondents<sup>a</sup>

In-house inspection classification	Com <sup>b</sup> (n=137)		Non-com <sup>b</sup> (n=288)		Total <sup>c</sup> (n=425)
	No.	%	No.	%	%
Sanitation	132	96	279	97	98
Food safety	127	93	250	87	89
Accident prevention	123	90	264	92	91
Equipment/facility maintenance	133	97	266	92	94

<sup>a</sup>No significant differences between the commercial and non-commercial groups' use of any of the four types of in-house inspection statements ( $p > .05$ )

<sup>b</sup>Respondents from commercial and non-commercial foodservice classifications.

<sup>c</sup>Percent of 'yes' responses from total number of responses (n=425); respondents could select more than one classification.

Respondents (n=425), who reported use of in-house inspection programs, were asked to identify the source of the programs. Their responses are summarized in Table 19. Seventy-nine percent of the in-house inspections used were developed by the respondent's company. This may be due to the greater percentage of non-commercial respondents and required use of quality assurance programs by health care organizations.



Table 19  
Source of in-house inspection programs used by  
commercial and non-commercial foodservice respondents<sup>a</sup>

Source of in-house inspection programs	Com <sup>b</sup> (n=137)		Non-com <sup>b</sup> (n=288)		Total <sup>c</sup> (n=425)
	No.	%	No.	%	%
Developed by my company	103	75	234	81	79
National Restaurant Association	52	38	19	7	17
Health department	89	65	142	49	54
Community college	4	3	8	3	3
Other <sup>d</sup>	11	8	37	13	11

<sup>a</sup>No significant difference between the commercial and non-commercial groups and any of the sources for in-house inspection programs ( $p > .05$ ).

<sup>b</sup>Respondents from commercial and non-commercial foodservice classifications.

<sup>c</sup>Percent of 'yes' responses who used in-house inspections (n=425); respondents could select more than one source.

<sup>d</sup>Included development by "self," government organization, and United States Air Force.

Principles of HACCP programs include evaluation and planning of the facility and food processing techniques, identification of critical control points, self-inspection and monitoring. Information was sought to determine the respondents' opinions regarding planning as part of food safety and food tampering prevention programs. Three questions (Appendix E, question

numbers 7, 8, 11) were used to evaluate the manager's belief in the use of food safety programs, self-inspection, and review of floor plans. The commercial and non-commercial respondents were combined for analysis of the three questions. The majority (>50%) of foodservice managers did believe that planning could reduce food tampering risk. Question seven inquired, "Do you think that food safety programs which include in-house inspections help reduce the risk of food tampering: 1. yes, reduces risk; 2. no; 3. do not know." Sixty-seven percent (n=350) of the total 522 responded, "yes, reduces risk"; 14% (n=71) "no"; and 19% (101) "don't know".

Question eight was more specific to self-serve foods. The question posed, "Some foodservice managers believe that self-serve foods may be at risk for food tampering. In your opinion, would in-house inspection and safety programs aimed at protecting self-serve foods help reduce the risk of food tampering: 1. yes, would reduce risk; 2. no." Of the 513 respondents, 71% (363) believed that "yes, it would reduce risk" while 29% (150) said "no".

The intent of question eleven was to determine respondents' opinions concerning the usefulness of advance planning, such as the plan review process for

floor plans, for potential food tampering risk reduction. The question asked, "If you were constructing or remodeling the self-serve area of a foodservice, do you believe a review of the floor plans (blueprints) would be useful to help reduce food tampering risk: 1. yes, would be useful; 2. perhaps some limited usefulness; 3. no, not very useful." The opinion expressed by 50% (n=255) was "yes, would be useful"; 39% (n=197) believed that "perhaps some limited usefulness" would result through the plan review process; and "not very useful" was reported by 11% (n=58) of the respondents (n=510).

Commercial and non-commercial data were treated together and cross tabulations made for respondents with and without self-serve foods to determine if there were differences between groups who used the two styles of food service. Two questions (Appendix E: question numbers 7,8) were analyzed to determine if there were differences between respondents with and without self-serve. There was no significant difference between the groups with and without self-serve foods in their opinions of the use of food safety programs, including in-house inspections to reduce food tampering risk ( $p=.82$ ). Also, there was no significant difference between the two groups' opinions that food safety

programs aimed at protecting self-serve foods would help reduce risk of food tampering ( $p=.76$ ).

Respondents with self-serve were asked, "If your foodservice has the potential for risk of food tampering associated with self-serve foods, what action would you take: 1. there is no risk; 2. do nothing and accept the risk; 3. make changes to reduce the risk." The opinion of respondents ( $n=369$ ) was that 9% (32) indicated there is "no risk" and 5% (20) would "do nothing and accept the risk". The majority, 86% ( $n=317$ ) reported that they would "make changes to reduce risk". There was no significant difference ( $p=.11$ ) between the commercial and non-commercial respondents who had self-serve foods and their expression of action they would take if food tampering risks were identified.

Respondents who indicated that they would make changes were asked, "Please identify whether or not you might make the following changes: a. implement in-house inspections for food safety; b. discontinue use of self-serve foods; c. increase labor for supervision of the self-serve food area; d. buy or modify self-serve equipment; e. redesign self-serve area by changing floor plan; f. other." Respondents could select more than one change. Results are listed in Table 20. Percentages were reported for the commercial and non-

commercial groups combined. There were no significant differences between the commercial and the non-commercial groups' identification of possible changes for any of the six categories.

Table 20

Changes to foodservice to reduce food tampering risk reported by respondents who believed there was a risk within their foodservice facility<sup>a</sup>

Changes to reduce food tampering risk	Com <sup>b</sup> (n=49)		Non-com <sup>b</sup> (n=268)		Total <sup>c</sup>
	No.	%	No.	%	%
Implement in-house inspections for food safety	36	73	227	85	83
Discontinue use of self-serve foods	7	14	56	21	20
Increase labor for supervision of the self-serve food area	21	43	100	37	38
Buy or modify self-serve equipment	32	65	171	64	64
Redesign self-serve area by changing floor plan	20	41	136	51	49
Other	5	10	33	12	4

<sup>a</sup>No significant difference between the commercial and non-commercial groups' comments on any of the responses ( $p > .05$ ).

<sup>b</sup>Combined responses for commercial and non-commercial respondents.

<sup>c</sup>Percent of 'yes' responses from total number of responses (n=317); respondents could select more than one classification.

Additional descriptive information was obtained about the foodservice manager's possible concerns regarding self-serve foods. The question directed to all respondents stated, "Below are some concerns associated with self-serve foods. Please indicate whether or not each would be a concern for you as a foodservice manager: a. controlling food cost; b. food safety concerns; c. space limitations; d. controlling labor cost; e. food quality control; e. other." The possible response for each was "yes" or "no". The greatest concern of both the commercial and non-commercial respondents was for food safety. Results are listed in Table 21. There were significant differences between the commercial and non-commercial respondents for two of the statements: concern for space limitations ( $p=.00$ ) and controlling labor costs ( $p=.01$ ).

Table 21  
Commercial and non-commercial foodservice respondents'  
concerns about self-serve foods

Concerns associated with self-serve foods	Com <sup>a</sup> (n=180)		Non-com <sup>a</sup> (n=343)		Total <sup>a</sup> (n=523)
	No.	%	No.	%	%
Controlling food costs	152	84	308	90	88
Food safety concerns	152	84	321	94	90
Space limitations	110	61	266 <sup>†</sup>	78	72
Controlling labor costs	126	70	289 <sup>†</sup>	84	79
Food quality control	144	80	307	90	86

<sup>a</sup>Percent 'yes' from total responses (n=523);  
respondents could select more than one response.

<sup>†</sup>Significant differences between the commercial and non-commercial groups ( $p < .05$ ).

Data from the commercial and non-commercial respondents were treated together for the question of concerns associated with self-serve foods; differences for respondents with and without self-serve food were investigated. Concerns about self-serve foods expressed by respondents are listed in Table 22. There was a significant difference between respondents with and without self-serve foods and concern for labor cost control ( $p = .03$ ). There were no significant differences for any of the other statements of concern.

Table 22  
Concerns about self-serve foods reported by foodservice respondents with self-serve and without self-serve foods

Concerns with self-serve foods	Yes <sup>a</sup> self-serve (n=376)		No <sup>a</sup> self-serve (n=142)		Total (n=518) %
	No.	%	No.	%	
Controlling food costs	335	92	124	91	89
Food safety concerns	347	96	125	94	91
Space limitations	275	82	100	78	72
Controlling labor costs	309	89	105 <sup>†</sup>	81	80
Food quality control	331	93	119	88	87

<sup>a</sup>Percent 'yes' from total responses (n=518); respondents could select more than one response.

<sup>†</sup>Significant difference between the respondents with self-serve and without self-serve ( $p < .05$ ).

However, for each concern statement, a higher percentage of respondents with self-serve expressed concern than those without self-serve. The area of greatest concern for self-serve respondents was food safety with a 96% 'yes' response, followed by food quality control and food cost concerns with 92%. There was a significant difference between the commercial/non-commercial and self-serve/no self-serve groups on the concern, controlling costs. Eighty-one percent of the commercial



and 90% of the non-commercial listed costs as a concern; 89% with self-serve and 81% without self-serve had cost concerns.

The final question on the questionnaire was open-ended and asked, "Are there any additional comments that you would like to make regarding food tampering, self-serve foods, food safety, or methods to protect foods for customers?" A total of 85 responses were received: 27 of the respondents without self-serve (19%) and 58 with self-serve (15%) made comments. The contents of the comments were varied but several topics were prevalent. Foodservice managers expressed concern about food tampering and how difficult they thought prevention might be if individuals were determined to do harm. Concern was voiced regarding budget reductions which have reduced the amount of staff to monitor the self-serve foods. Several foodservice managers wanted to know more about the topic and asked where they could obtain additional information. There were a few foodservice managers who were not concerned about tampering: respondents from small communities; military facilities with tight security; or large chains with company inspection policies. Individual comments are listed in Appendix G.

## Applications

An effort was made to obtain information about the population of foodservice managers and facilities operating in the United States. Difficulties in obtaining specific demographic data on managers were encountered: the population is large and diverse; many foodservice managers are not represented by foodservice or trade organizations. Restaurants and foodservice operations employed approximately 6,571,000 workers in 1991. 1990, retail sales were 170.3 billion dollars; the expenditure by consumers eating or drinking away from home was 198.5 billion dollars in 1991. The numbers of employees, retail sales, and customer expenditures continue to grow (97). The number of commercial foodservice facilities in 1991 was 539,635; non-commercial, 177,910. Total sales in 1992 were 260.303 billion dollars (98).

The trade publication, *Restaurants and Institutions*, used survey data to profile twelve management-level positions in the foodservice industry (99). Most of the information dealt with salaries, promotions, pay increases, and age and marital status. Data for education was excerpted for positions which were most like the titles reported by the Phase 1

respondents and summarized in Table 23. The findings from Phase 1 data (Table numbers 9 and 11) were that 67% of the respondents had college degrees equivalent to Bachelor of Arts or Science or higher. The largest percentage (72%) of the respondents were managers or directors of foodservice operation. The Phase 1 sample was similar to the sample reported in *Restaurants and Institutions* with respect to the percentage of foodservice directors which had college degrees.

Table 23  
College degrees held by individuals in management-level positions in the foodservice industry<sup>a</sup>

Position	College degree %
Foodservice director	64
District manager	45
Executive chef	32
Dietitian	91

<sup>a</sup>Source: Weinstein J, Stephenson S, McCarthy B. Jobs '92. *Restaurants and Institutions*. 1992;102(1):56-76)

The NACUFS association was contacted to determine if demographic information was kept about members. A survey was recently distributed to the members, but results will not be available until after May, 1993. The survey is designed to gather wage information,

however, a question is included asking the educational requirements for the foodservice director and other foodservice employees within the organization (100).

### Summary of Phase 1 Results

The sample consisted of respondents from commercial and non-commercial foodservice facilities, some of which offered self-serve foods. Answers to the Phase 1 questionnaire were analyzed to characterize the respondents and their foodservice facilities, and to determine if differences existed between different groups of respondents or types of facilities.

The educational background of the respondents was different. There were significant differences between the commercial and non-commercial groups in the source of their foodservice-related education, highest education degree, and area of study. The majority who received on-the-job foodservice-related education represented the commercial foodservice facilities. The non-commercial respondents had community college or higher degrees. The largest number of respondents studied dietetics and represented non-commercial foodservice facilities.

Differences were noted in the size and location of the foodservice facilities. There was a significant difference between the commercial and non-commercial respondents with respect to the type of the facility; restaurants were the majority of commercial types; health care dominated the non-commercial types. A significant difference was found between the size of the population where commercial and non-commercial foodservice facilities were located. The commercial respondents were located in smaller population areas. There was not a significant difference in rural or urban classification of the population areas. There was a significant difference between the numbers of customers served in the commercial and non-commercial foodservice facilities; non-commercial had the largest volume of customers.

There was a low level of awareness of food tampering expressed by both the commercial and non-commercial groups. No significant difference in the amount that had been heard about food tampering was found between the groups. The majority of respondents expressed some concern; respondents with self-serve foods had a higher level of concern than those without self-serve. There were significant differences in concern expressed by commercial and non-commercial

foodservice managers for general food tampering and food tampering within their facilities. Significant differences in the awareness or amount heard and concern for food tampering were found. Respondents who were more aware were more concerned.

Significant differences between the respondent's source of foodservice-related education and concern for food tampering were noted; respondents with on-the-job education expressed highest concern. There was no significant difference between the educational level and concern; however, it approached significance ( $p=.06$ ). A higher percentage of respondents with college degrees expressed greater concern than those without degrees.

Significant differences in concern were expressed by respondents with and without self-serve foods. Respondents with self-serve voiced greater concern. There was also a significant difference between the commercial and non-commercial groups' use of self-serve foods. Salad bars were most used by both groups. More than twice the percentage of non-commercial than commercial used self-serve. This may contribute to the differences in food tampering concern between the commercial and non-commercial groups. The greater use of self-serve and greater concern expressed by self-serve users may also have contributed to the higher

participation rate of the non-commercial group. A second factor which was identified earlier was the higher level of education achieved by the non-commercial respondents.

Concern for food tampering generally increased as facility size increased; those respondents who served large numbers of customers also expressed significantly greater concern. Significantly more urban respondents expressed concern for food tampering than rural. Commercial and non-commercial respondents were combined for these analyses.

The use of HACCP-based programs was explored. The majority of all managers in the sample did not use HACCP-based programs. There was no significant difference between the commercial and non-commercial groups' use of HACCP. However, the majority of respondents used in-house inspections, and many used more than one type. Also, most respondents believed that food safety programs, in-house inspections, and plan review could reduce food tampering risk. There was no significant difference between respondents with and without self-serve foods with respect to the opinion that in-house inspection programs for self-serve foods could reduce the risk of food tampering. The majority of combined commercial and non-commercial respondents

would make changes to decrease food tampering risk. For respondents with self-serve, there were no significant differences between the commercial and non-commercial groups' intent to make changes to help reduce food tampering. No significant differences were found in the types of changes considered between the commercial and non-commercial respondents.



## Results and Discussion of Phase 2

The Phase 2 instruments were mailed to the 376 respondents who had self-serve foods in their operation as identified in Phase 1. Of these, 64 were commercial and 312, non-commercial. All respondents with self-serve were included in Phase 2. The sample was divided into the experimental (n=186) and control group (n=190), both of which had the same proportional representation by both commercial and non-commercial foodservice managers. The experimental group received the treatment (Food Tampering Hazard Risk Reduction self-instructional workbook) and the post-test (Food Tampering Hazard Inspection form plus questions); the control group received the post-test only.

The statistical analysis of the effects of the workbook on managers' responses was done by the Chi square test at a significance level of  $p < .05$  and the t-test. Eleven null hypotheses were tested. Hypotheses one through six were based on the questionnaire portion of the post-test; hypothesis seven referred to the facility assessment form; hypotheses eight through eleven related comparisons of Phase 1 and Phase 2. Analyses also were conducted to determine if there were significant differences between responses to the Phase 1

questionnaire and the Phase 2 post-test questionnaire. Did changes occur after respondents' exposure to the workbook and/or the post-test?

One additional question was asked of the experimental group to learn if they had read the workbook. This information was needed to provide insight into their responses. The question (Appendix F: question number 7) was, "How much of the workbook did you read: 1. 75-100%; 2. 50-74%; 3. 25-49%; 4. less than 25%". Fifty-three percent had group read 75% or more of the workbook; 24%, 50 to 75%; 8%, 25 to 49%; and 14%, less than 25%. Because 47% of the experimental group read less than 74% of the workbook, it is probable that a large number of the concepts had not been studied by half of the respondents. Therefore, differences between the control and experimental group may not be as evident as if a larger percentage of the experimental group had completed the entire workbook. Possible reasons for not reading the entire workbook could include lack of manager's time, low level of interest about food tampering, or lack of incentive or motivation. No question was asked concerning this. It is difficult to motivate respondents through a mailed self-instructional document (75).

Responses to questions about foodservice managers' opinions of the value of in-house inspection programs to reduce risk, action taken against food tampering, and concern about risk in their facility were compared for respondents who read 75% or more of the workbook with those who read less than 75%. The responses were tested with Chi square. There was a significant difference ( $p=.00$ ) between the respondents with respect to the action they would take against food tampering hazards: more respondents who read 75% or more of the workbook would make changes (91%) than those who read less (80%). All who read 75% or more indicated that they would make changes in their facilities to reduce food tampering hazards. There were no other significant differences. Findings of the analyses may indicate that changes in foodservice managers' responses may not have been directly related to the effect of the workbook.

The workbook (Appendix F) was divided into four sections: introduction, the basic steps, using the basic steps, and additional information. The introduction contained the workbook objectives which were: 1. to show the foodservice manager food tampering hazards of customer self-serve foods; 2. to explain steps to control food tampering in self-serve areas; 3. to describe ways to measure the chance of food

tampering. The introduction also contained general information about the food tampering problem, individuals who might be potential tamperers, and foods at risk for tampering. A section describing what managers need to know to help control the problem and instructions for using the workbook were included.

The description of the self-serve food protection program was identified in section two. The basic steps to the program were: step one, identify food tampering hazards; step two, identify control check points; step three, use a monitoring system. Each of the three steps was explained and examples were included.

The third section, using the basic steps, was comprised of three activities and summary questions to illustrate the concepts related to food tampering protection. The concept presented for activity one was: self-serve area floor plans which allow the most observation of customers, food, and employees have less food tampering hazard. Four floor plan examples of self-serve food areas were provided for activity one. Respondents were asked to evaluate the floor plans, then take the self-test. The answers to the self-test questions with discussion and summary followed. The concept for activity two was: the control of food tampering hazards may depend on placement of self-serve

areas in foodservices; greater control of food tampering hazards is possible if self-serve areas are placed in the main path of customers and easily observed. Two examples of floor plans were provided. One plan depicted the self-serve area adjacent to the kitchen with a direct customer and employee traffic flow; the other showed the self-serve area removed from the kitchen with a non-direct traffic flow pattern and location not easily observed by employees. The same question and answer format as for activity one was used. Questions relating to the two examples were provided as a self-test. Answers to the questions and a discussion of the floor plans followed. The third activity involved making a food chart for a food item served in the respondent's foodservice operation. The concept was: charting a food item uses the three basic steps of self-serve food protection; this is a way to begin your own self-serve food protection program. The process of menu item evaluation, identification of possible hazards, and systems to control the identified hazards integrated the three basic steps and formed the basis for the program. These three fundamental steps were central to the simplified HACCP system used in the workbook. Respondents were directed to choose one item they offered for self-serve, then list how the food was

handled and prepared for service. A general example was provided to direct the respondents. A blank chart was included so that respondents could record information in three categories: 1. process; 2. identify food tampering hazards and control check points; 3. monitoring systems. This was the most demanding and detailed activity. The final exercise in the third section was a set of summary questions based on the information contained in the workbook. Answers to the questions and discussion were included.

The workbook concluded with section four. This section was added so that respondents could get additional information about HACCP systems. A brief description of the Hazard Analysis Critical Control Point (HACCP) system of food safety and seven basic HACCP principles were listed (53). Recommended references to the HACCP system were provided.

The post-test was constructed in two parts. The first part was the Foodservice Facility Assessment form, a self-inspection tool, which respondents used to evaluate the food tampering possibilities associated with their foodservice. The form contained eleven sections to guide and numerically record the evaluation. The eleven sections were:

1. self-serve menu items
2. source of self-serve food
3. entry to the kitchen and access to back-up foods
4. food protection
5. observation of the back-up food while stored
6. type of customer self-serve
7. food protection during self-serve
8. observation of the self-serve food area
9. food protection inspection before serving
10. food protection inspection during serving
11. design of the self-serve area.

Each feature within the sections was assigned a numerical risk score called a "tamper value".

Respondents selected one feature or description in each section which best described their foodservice. They added the "tamper value" points to obtain a "tamper value score" for their facility. Respondents could compare this score to the scoring code which provided immediate feedback concerning the "food tampering hazard rating" of their facility. The second part of the post-test was a seven-question questionnaire to obtain data for analyses of the effectiveness of the workbook.

## Null hypotheses one through seven

H<sub>0</sub>1: There is no significant difference between the experimental and control groups' ability to identify food tampering hazards through floor plan evaluation.

The first null hypothesis was comparing the experimental and control groups' ability to associate potential food tampering hazards with floor plan evaluation (Appendix F: question number 1). Chi square analysis was used. The question was, "Which of the Sample Plans in the Food Hazard Inspection Form has the greatest food tampering hazard, Plan 1, Plan 2, Plan 3, or Plan 4?" Responses are summarized in Table 24. Plan 1 depicted a self-serve area that was considered to be the most hazardous in terms of food tampering due to the lack of ability to observe customers and to service the area. Sixty-six percent of the experimental respondents and 52% of the control respondents correctly selected Plan 1. Plan 2 depicted a design considered less hazardous than Plan 1 and was selected by 24% of the experimental and 21% of the control respondents. Plan 3 and Plan 4 were the safest designs and approximately equal in hazard potential even though they were two different floor plans. Plan 3 and Plan 4 were chosen by



10% of the experimental group; 27% of the control group. The workbook being tested contained an exercise with examples and discussion about floor plans for self-serve food areas and factors related to food tampering potential. The floor plans that appeared in the form in reference to this question were also included in the workbook activity number one and self-test. Therefore, the experimental group had the answer to this question available to them and if more had read the workbook a higher percentage of correct responses would have been expected.

Hypothesis one was rejected. There was a significant difference between the experimental and control groups' ability to identify possible food tampering hazard through floor plan evaluation ( $p=.01$ ). The workbook was effective in producing knowledge differences between the experimental and control groups; a large number of the experimental group could correctly associate floor plan design principles with food tampering risk.

Table 24  
Floor plans selected by experimental and control groups<sup>†</sup>

Plan number		Experimental		Control	
		No.	% <sup>a</sup>	No.	% <sup>b,†</sup>
#1	One side customer/ employee access	73	66	55	52
#2	Two side customer/ employee access	27	24	22	21
#3	One side customer access; opposite side restricted employee access	5	5	16	15
#4	Circular; one side customer access; opposite side employee access	6	5	13	12

<sup>a</sup>Percent of responses.

<sup>b</sup>Percent of responses.

<sup>†</sup>Significant difference between the experimental and control group with respect to selection of floor plans having the greatest potential for food tampering hazards ( $p < .05$ ).

H<sub>0</sub>2: There is no significant difference in level of concern of food tampering between the experimental and control group.

Null hypothesis two investigated the change in concern for food tampering between the experimental and control groups. Did the information provided in the workbook change the concern level of the respondents? The question (Appendix F: question number 2) was, "Generally, how concerned are you about the possibility

of food tampering in your foodservice: 1. very concerned; 2. somewhat concerned; 3. not at all concerned." The responses of both groups were equivalent in each category of concern as summarized in Table 25. Twenty-three percent of both groups were "very concerned"; 63% were "somewhat concerned"; and 14% "not at all concerned".

Table 25  
Concern for food tampering in the facilities represented by the experimental and control groups<sup>a</sup>

Level of concern	Experimental (n=118)		Control (n=117)	
	No.	% <sup>b</sup>	No. <sup>b</sup>	%
Very	27	23	27	23
Somewhat	74	63	74	63
Not at all	17	14	16	14

<sup>a</sup>No significant difference between the level of concern expressed by the experimental and control groups with respect to food tampering within their foodservice facilities ( $p > .05$ ).

<sup>b</sup>Percent of responses.

Hypothesis two was retained: there was no significant difference in the level of concern of food tampering occurring in the respondent's foodservice facility between the experimental and control group ( $p = .99$ ). However, the concern expressed by both the experimental and control groups was higher than concern

reported by Phase 1 respondents. The level of concern expressed by all Phase 1 respondents was: "very concerned, 15%; "somewhat concerned", 55%; "not at all concerned", 30%. The level of concern reported by Phase 1 respondents with self-serve, which formed the population for Phase 2 was; "very concerned", 14%; "somewhat concerned, 59%; "not at all concerned", 27%. The reasons for the increased concern from Phase 1 were considered. There were no identified national news reports of product or food tampering during the time period between administration of Phase 1 and Phase 2. The users of the workbook did not have greater changes in the level of concern. The inspection form which was used by both groups may have served as an educational tool and increased awareness and concern. This idea was tested in hypothesis three.

H<sub>0</sub>3: There is no significant difference in the level of self-expressed concern about food tampering possibility in the foodservice facilities of the experimental and control groups after using the Food Tampering Hazard Inspection form.

Hypothesis three explored the effect of use of the Food Tampering Hazard Inspection form on the respondent's concern for food tampering. The question

(Appendix F: question number 3) asked, "How has your concern about the possibility of food tampering in your facility changed after completing the Food Tampering Hazard Inspection: 1. concern is greater; 2. concern is less; 3. concern has not changed, same." The experimental and control group responses were very similar for each level of concern stated. Both groups experienced a change in concern. Both had increased concern. The experimental group experienced an increase in concern of 36%; the control, 37%. Concern remained unchanged for 62% of the experimental and 59% of the control group respondents. Only 3% of the experimental and 4% of the control reported a decrease in food tampering concern within their foodservice facility. Responses are summarized in Table 26. However, these differences were not statistically significant.

The level of concern of the respondents before using the post-test inspection form was investigated. Responses are listed in Table 27. Change scores were computed by assigning values from negative two, or decrease in concern, to positive two, or increase in concern, to cells in the chi square table. Both groups' scores were positive indicating a change toward increasing concern. The experimental groups' score was 0.33; control, 0.23. A slight moderating effect was

observed in reported change of concern; some respondents who were "very concerned" became slightly less concerned; some who were "not at all concerned" became more concerned.

Table 26  
Reported change in food tampering concern of experimental and control groups after using the Food Tampering Hazard Inspection form<sup>a</sup>

Change in concern	Experimental (n=118)		Control (n=117)	
	No.	% <sup>b</sup>	No.	% <sup>b</sup>
Greater	42	36	43	37
Less	3	3	5	4
Same	73	62	69	59

<sup>a</sup>No significant difference between the experimental and control groups' change in level of concern after completing the Food Tampering Hazard Inspection form ( $p > .05$ ).

<sup>b</sup>Percent of responses.

Table 27  
Level of food tampering concern of experimental and control groups before using the Food Tampering Hazard Inspection form

Level of concern	Experimental (n=117)		Control (n=116)	
	No.	% <sup>a</sup>	No.	%
Very	12	10	12	10
Somewhat	64	55	76	66
Not at all	41	35	28	24

<sup>a</sup>Percent of respondents.

Hypothesis three was retained: there was not a significant difference in the change of level of concern after completing the Food Tampering Hazard Inspection part of the post-test by the experimental and control groups ( $p=.73$ ). This finding further supports that the Food Tampering Hazard Inspection form portion of the post-test functioned as an educational tool, as shown by an increase in concern by 36% of the respondents.

H<sub>0</sub>4: There is no difference in belief between the experimental and control groups that in-house inspections can reduce food tampering hazards.

Hypothesis four involved finding out if in-house inspections were viewed as reducing food tampering hazards by the experimental and control groups. The question (Appendix F: question number 4) read, "Do you think that in-house inspections, such as the Food Tampering Hazard Inspection, can help reduce the possibility of food tampering: 1. yes; 2. no; 3. do not know." Response to this question was very consistent with responses for questions two and three of the post-test; responses for both experimental and control groups were nearly equivalent. Responses are listed in Table 28. There was a slight increase for both groups in the opinion that in-house inspections

could help reduce food tampering. The majority of both groups thought that in-house inspections would be of value to reduce food tampering; 68% of the experimental and 70% of the control group responded positively. Ten percent of both groups said those inspections would not help.

Table 28  
Experimental and control groups' opinion on post-test of in-house inspections as a way to reduce food tampering<sup>a</sup>

Opinion of risk reduction	Experimental (n=118)		Control (n=117)	
	No.	% <sup>b</sup>	No.	% <sup>b</sup>
Yes, reduces risk	80	68	82	70
No	12	10	12	10
Do not know	26	22	23	20

<sup>a</sup>No significant difference between the experimental and control groups' opinions that in-house inspections could help reduce food tampering ( $p > .05$ ).

<sup>b</sup>Percent of responses.

The groups' opinion of the usefulness of in-house inspections prior to the post-test was examined. The opinion of the experimental and control groups regarding in-house inspections are listed in Table 29. A change score was computed for the experimental and control groups. The score for the experimental group was 0.26; control, -0.14. The experimental group changed with



more believing in the use of in-house inspections. The workbook may have contributed to the experimental groups' confidence in in-house inspection programs. The post-test led the respondents through an in-house inspection, but the control group lacked the exposure to the concept of this type of inspection as part of a food tampering reduction program.

Table 29  
Experimental and control groups' opinion of in-house inspections as a way to reduce food tampering before the post-test

Opinion of risk reduction	Experimental (n=117)		Control (n=116)	
	No.	% <sup>a</sup>	No. <sup>b</sup>	%
Yes, reduces risk	72	62	80	69
No	18	15	16	14
Do not know	27	23	20	17

<sup>a</sup>Percent of responses.

<sup>b</sup>Data from Phase 1; no significance testing done.

Hypothesis four was retained: there was not a significant difference between the experimental and control groups' opinion that in-house inspections would help to reduce food tampering ( $p=.90$ ).

H<sub>0</sub>5: There is no significant difference in understanding of a HACCP principle between experimental and control groups.

Hypothesis five was developed to test the respondent's knowledge of a basic HACCP principle, the difference between the monitoring and inspection process. Within the HACCP system, monitoring is used to find out if a process occurring at a critical control check point is being correctly watched. Monitoring is not the same as inspecting. Inspections, observations and measurements can give information used in the monitoring process. The question (Appendix F: question number 5) used to gather data was, "Is monitoring the same thing as inspecting in a foodservice: 1. yes; 2. no." Eighty-six percent of the experimental group correctly answered the question; 83% of the control group were correct. Responses are summarized in Table 30.

Hypothesis five was retained: there was no significant difference between the experimental and control groups' understanding of a HACCP principle ( $p = .64$ ).

This question was also designed to help identify the number of respondents who read the workbook. This same question on the post-test was contained in a self-

test within the workbook. A significantly larger percentage of correct responses by the experimental than the control group was expected if the workbook had been read. Only 19% of the total respondents to Phase 1 reported using a HACCP-based program. The HACCP system of monitoring is important to the process, however, this question may not have adequately tested knowledge of a HACCP principle, rather semantics of terminology. The difference between the words could have resulted in the correct answer from the respondents. Therefore, the question may not have been a valid measure of the concept. Also, only one question was asked concerning a HACCP principle. Several different questions could have been used to measure different aspects of the concept to strengthen the internal validity of the line of questioning (91).

Table 30  
Experimental and control groups' response to the post-test question on a HACCP principle<sup>a</sup>

Response	Experimental (n=118)		Control (n=114)	
	No.	% <sup>b</sup>	No.	%
Yes	17	14	20	18
No	101	86	94	83

<sup>a</sup>No significant difference between the experimental and control groups' understanding of a HACCP principle (p>.05).

<sup>b</sup>Percent of responses.

H<sub>0</sub>6: There is no significant difference between experimental and control groups in intent to take action to reduce food tampering hazards.

Hypothesis six explored action the respondents might take if they believed there was a possibility of food tampering hazard in their foodservice facility. The question (Appendix F: question number 6) asked, "If you believe that there is a possibility of food tampering hazard in your foodservice, what action would you take: 1. there is no possibility; 2. do nothing and accept the possibility; 3. make changes to reduce the possibility." The responses between the groups were not statistically significant. However, 97% of both groups would make changes to reduce food tampering hazards. There were no experimental respondents who indicated that there was not a possibility of food tampering hazards in their facility. This may not have been a strong indicator of intent; it may have been more of a measure of willingness to consider change. Responses to question six are summarized in Table 31.

Hypothesis six was retained: there was not a significant difference between the experimental and control groups' intent to take action if the possibility of food tampering was found in their foodservice facility ( $p=.14$ ).

Table 31

Experimental and control groups' reported action to take in response to food tampering possibility in their foodservice facilities<sup>a</sup>

Action to reduce risk	Experimental (n=114)		Control (n=115)	
	No.	% <sup>b</sup>	No.	%
No possibility	0	0	3	3
Do nothing	3	3	1	1
Make changes	111	97	111	97

<sup>a</sup>No significant difference between the experimental and control groups' intent to take action if they believed food tampering hazards existed in their foodservice facilities ( $p > .05$ ).

<sup>b</sup>Percent of responses.

An overall increase in intent to take action was noted for both groups compared to the responses before the post-test. The groups' report of intended actions before the post-test are listed in Table 32. The change score for the experimental group was 0.22; control, 0.15. Exposure to more information on food tampering and specific ways to decrease risk tended to result in greater intent to make changes.

Table 32

Experimental and control groups' reported action to take in response to food tampering possibility in their foodservice facilities before the post-test<sup>a</sup>

Action	Experimental (n=109)		Control (n=113)	
	No. <sup>b</sup>	%	No.	%
No possibility	9	8	8	7
Do nothing	8	7	5	4
Make changes	92	84	100	89

<sup>a</sup>Data from Phase 1; no significance testing done.

<sup>b</sup>Percent of responses.

H<sub>0</sub>7: There is no significant difference in foodservice facility mean tamper value scores between the experimental and control groups.

Hypothesis seven looked at the experimental and control groups' facility assessment scores obtained by use of the Food Tampering Hazard Inspection form portion of the post-test. Respondents answered questions related to types of food, source of foods, food protection and observation, type of service, and floor plan of the self-serve area which were contained in eleven sections of the post-test (Appendix F).

Numerical values (tamper values) were selected by the respondents corresponding to their evaluation of the facility for each of the eleven sections. Tamper values were added to arrive at a Tamper Value Score which

corresponded to a Food Tampering Hazard Rating. The range of possible scores was from 12 to 62 points. The scores for the experimental group ranged from 14 to 36; control group scores ranged from 13 to 36. Graphs of the experimental and control groups' Tamper Value Scores are in Appendix H. Summaries of the responses for the experimental and control groups for each of the eleven sections are in Table 33.

The mean for the experimental group was 22.32 tamper value score; the control group mean was 22.22. Mean scores of the groups were compared by use of the t-test. The t value was .15.

For the respondents' use at the end of the facility evaluation, hazard levels were assigned to the scores: 12 to 20 points, "least chance of food tampering"; 21 to 50 points, "moderate chance"; 51 to 62 points, "greatest chance." Scores were grouped so that they could get immediate feedback on the relative food tampering hazard within their operation. Forty percent of the experimental groups' score was in the "least chance of food tampering" range; 41% of the control group scored in the same range.

Table 33

Experimental and control group responses to the Food Tampering Hazard Inspection form of the post-test

Section number, description	1 <sup>a</sup> E / C <sup>b</sup> No.	2 E / C No.	3 E / C No.	4 E / C No.	5 E / C No.	Total E / C No.	Chi square	Significance
1. Menu items	4 / 3	51/54	-----	60/57	-----	115/114	0.30	.86
2. Food source	-----	74/74	19/18	23/23	-----	116/115	0.02	.99
3. Kitchen entry	38/36	-----	67/68	-----	11/10	116/114	0.09	.96
4. Food protection	77/74	-----	40/40	-----	0 / 3	117/117	3.06	.22
5. Observation: back-up foods	83/87	31/28	-----	-----	3 / 2	117/117	0.45	.80
6. Self-serve type	38/31	79/86	-----	-----	-----	117/117	0.74	.39
7. Food protection: service	77/82	-----	-----	38/30	3 / 5	117/117	2.38	.30
8. Observation: self-serve area	43/41	71/74	-----	-----	3 / 2	117/117	0.31	.86
9. Food inspection: before serving	89/92	-----	24/21	-----	4 / 4	117/117	0.25	.88
10. Food inspection: during serving	64/65	52/44	-----	-----	1 / 8	117/117	6.12	.05*
11. Design of self- serve area <sup>c</sup>	33/36 (ex. 3) 3 / 3 (ex. 4)	-----	60/57 (ex. 2)	-----	21/18 (ex. 1)	117/114	0.40	.94

<sup>a</sup> Numbers 1 to 5 refer to the tamper value assigned to responses in each section; 1 being lowest and 5 highest risk.

<sup>b</sup> Numbers of responses to tamper values in each section by experimental and control groups; (n=234).

<sup>c</sup> Example 1 was assigned 5 tamper value points; example 2, 3 points; examples 3 and 4, 1 point.

\* Significant difference between the experimental and control groups' use of food protection inspections during serving (p<.05).



Hypothesis seven was retained: there was no significant difference between the mean scores of the facility assessment form for the experimental and control groups.

This lack of difference may be attributed to the fact that the Food Tampering Hazard Inspection form of the post-test actually functioned as an educational tool. Perhaps the form was self-contained enough so that all respondents could evaluate their facility. The similarity of the evaluations of both groups was surprising.

Each of the eleven sections of responses were compared for experimental and control groups using Chi square analyses. Only one section showed a significant difference: there was a significant difference between the experimental and control groups' use of food protection inspections during the serving of self-serve foods ( $p=.05$ ). Seven percent of the control group reported that foods were not inspected during serving; 1% of experimental reported the lack of inspection. Forty-four percent of experimental and 38% of the control group reported random inspection of foods during serving. In general, a larger percentage of the experimental group inspected the self-serve foods during serving.

Four examples of floor plans used for self-serve foods were identified in section 11 of the post-test. Example 1 showed a plan with the greatest possibilities of food tampering; example 2 was considered slightly less hazardous; examples 3 and 4 had the lowest food tampering hazard. Respondents were asked to select the floor plan closest to the layout of the self-serve food area in their foodservice facility. Using Chi square analyses, the floor plan examples selected by respondents were cross tabulated with respondents' concern for food tampering. Responses to section 11 and question 2 of the post-test were the sources of the data. Example 1 was selected by 17% of the respondents as the floor plan nearest the self-serve layout in their foodservice operations; 51% selected Example 2; 30% selected Example 3; 3% selected Example 4. There was not a significant difference between the level of concern and floor plans selected ( $p=.24$ ).

Even though Example 1 was estimated to be the most hazardous, only 8% of respondents with this plan were "very" concerned; 18% were "not at all" concerned, the highest percentage for all four plans. For Example 2, 22% were "very" concerned; 13% were "not at all" concerned. The largest number of respondents chose floor plan Example 2 and were "somewhat" concerned.

Examples 3 and 4 were similar in percentages of responses; 30% with Example 3 and 33% with Example 4 were "very" concerned; 57% with Example 3 and 50% with Example 4 were "somewhat" concerned. Example 2 was used by the largest percentage of respondents, 51%; Example 3 had 30%; Example 1 had 17%; and Example 4 had 3%. Therefore, the two floor plans estimated to be the most safe were used by 33% of the respondents. Data are summarized in Table 34.

Table 34  
Experimental and control groups' selection of floor plan examples and level of food tampering concern<sup>a</sup>

Floor plan (%)	Very concerned			Somewhat concerned			Not at all concerned		
	No.	% <sup>b,c</sup>	(%) <sup>c</sup>	No.	%	(%)	No.	%	(%)
1. <sup>d</sup>	3	6	(1)	28	19	(12)	7	22	(3)
2. <sup>e</sup>	25	49	(11)	76	52	(33)	15	47	(7)
3. <sup>f</sup>	21	41	(9)	39	27	(17)	9	28	(4)
4. <sup>g</sup>	2	4	(1)	3	2	(1)	1	3	(1)

<sup>a</sup>No significant difference between the floor plans of the self-serve area of the respondents and their level of concern ( $p > .05$ ).

<sup>b</sup>Percentages calculated for respondents in the "very concerned" category; similarly for the "somewhat" and "not at all concerned" categories.

<sup>c</sup>Percent of total respondents ( $n=229$ ).

<sup>d</sup>One side customer/employee access.

<sup>e</sup>Two side customer/employee access.

<sup>f</sup>One side customer access; opposite side restricted employee access

<sup>g</sup>Circular; one side customer access; opposite side employee access.

### Null hypotheses eight through eleven

Comparisons were made between the Phase 1 respondents with self-serve foodservice operations who became the sample for Phase 2 and continued with the study. Respondent's replies to the Phase 1 questionnaire (Appendix E) and the questionnaire portion of the Phase 2 post-test (Appendix F) were analyzed. Four null hypotheses were used to determine if any changes occurred after exposure to the Phase 2 workbook and post-test. The areas investigated were food tampering concern, perception of food tampering hazards, and intent to take action to reduce food tampering risk.

H<sub>08</sub>: There is no significant difference between the experimental and control groups' report of concern for the possibility of food tampering occurring in their facility before and after the post-test.

The two questions used for analysis were question number four of the Phase 1 questionnaire and post-test question number two. The purpose was to determine if changes in concern were found before and after the workbook and post-test. Responses are recorded in Table 35.

Table 35  
 Experimental and control groups' reported concern for food tampering in their facilities before and after the post-test

Level of concern	Exp.1 <sup>a</sup> (n=117)		Exp.2 <sup>b</sup>		Con.1 <sup>a</sup> (n=116)		Con.2 <sup>b</sup>	
	No.	% <sup>c</sup>	No.	%	No.	%	No.	%
Very	12	10	27	23	12	10	27	23
Somewhat	64	55	73	62	76	66	73	63
Not at all	41	35	17	15	28	24	16	14

<sup>a</sup>Experimental and control respondents from Phase 1; before the post-test.

<sup>b</sup>Experimental and control respondents from Phase 2; after the post-test.

<sup>c</sup>Percent of responses.

<sup>d</sup>Significant difference in food tampering concern before and after the post-test for the experimental group ( $p < .05$ ).; Significant difference in food tampering concern before and after the post-test for the control group ( $p < .05$ ).

Hypothesis eight was rejected: there was a significant difference between both the experimental and control groups' reported concern of food tampering occurring within their facility before and after the post-test. Chi square analysis revealed a significant difference in concern of both the experimental group ( $p = .00$ ) and the control group ( $p = .01$ ).

There was not a significant difference between the experimental and control groups' concern after taking the post-test (hypothesis two) but there was a

significant difference for both groups before and after the post-test (hypothesis eight). This would indicate that the post-test provided information and reinforcement of food tampering factors which increased the concern of the respondents.

H<sub>0</sub>9: There is no difference between the experimental and control groups' opinion that in-house inspections could help reduce the possibility of food tampering before and after the post-test.

The purpose of this investigation was to see if the instruments, especially the Food Hazard Inspection form of the post-test, changed the opinions of the groups about the use of in-house inspection. Question seven of the questionnaire and question four of the post-test were compared for the experimental and control groups.

Both groups reported a small increase after the post-test that in-house inspections could help reduce food tampering; 2% increase for the experimental group; control, 1%. Despite access to the workbook, the experimental group still did not know whether in-house inspections would be helpful; 23% before the post-test; 22% after the post-test. Results are listed in Table 36. For respondents who read the workbook, the opinion that in-house inspections were helpful was expected.

In-house or self-inspections document information which can be used as part of the monitoring process in a HACCP-based system. This concept may not have been understood by the respondents or perhaps they had prior or ongoing experiences with in-house inspections which they did not consider useful.

Table 36

Experimental and control groups' opinion of in-house inspections to reduce food tampering before and after the post-test<sup>a</sup>

Opinion of risk reduction	Exp.1 <sup>b</sup> (n=117)		Exp.2 <sup>c</sup>		Con.1 <sup>b</sup> (n=116)		Con.2 <sup>c</sup>	
	No.	%	No.	%	No.	%	No. <sup>d</sup>	%
Yes, reduces	72	62	80	64	80	69	81	70
No	18	15	11	9	16	14	12	10
Do not know	27	23	26	22	20	17	23	20

<sup>a</sup>No significant difference in the experimental groups' opinion that in-house inspections could reduce food tampering ( $p > .05$ ); no significant difference in the control groups' opinion that in-house inspections could reduce food tampering ( $p > .05$ ).

<sup>b</sup>Experimental and control respondents from Phase 1; before the post-test.

<sup>c</sup>Experimental and control respondents from Phase 2; after the post-test.

<sup>d</sup>Percent of responses.

Hypothesis nine was retained: there was no significant difference between the respondents' opinions that in-house inspections could help reduce the risk of

food tampering before and after the post-test. The level of significance for the experimental group was  $p=.80$ ; control group was  $p=.19$ .

H<sub>0</sub>10: There is no significant difference between the experimental and control groups' opinion of food tampering risk associated with self-serve foods and intended action before and after the post-test.

Question 9-b of the questionnaire and question six of the post-test were cross-tabulated for the experimental and control groups. The intent of the questions was to determine what actions to reduce food tampering the respondents would take if food tampering hazards were found in their foodservice. A difference found for both the experimental and control group respondents was their intent to make changes to reduce the possibility of food tampering in their facility. The percentage of experimental group respondents intending to make changes increased from 84% before to 98% after the post-test; the control group increased from 89% to 97%. A decrease in respondents indicating "there is no possibility", and "do nothing and accept the possibility" was observed for both groups after the post-test. Responses are listed in Table 37.



Table 37

Experimental and control groups' reported intent to take action to reduce food tampering reported before and after the post-test<sup>a,†</sup>

Action to reduce risk	Exp.1 <sup>b</sup> (n=109)		Exp.2 <sup>c</sup>		Con.1 <sup>b</sup> (n=113)		Con.2 <sup>c</sup>	
	No.	% <sup>e</sup>	No. <sup>c</sup>	%	No.	%	No. <sup>d</sup>	%
No possibility	9	8	0	0	8	7	3	3
Do nothing	8	7	2	2	5	4	1	<1
Make changes	92	84	107	98	100	89	109	97

<sup>a</sup>No significant difference in the experimental groups' intent to take action to reduce food tampering ( $p>.05$ ).

<sup>b</sup>Experimental and control respondents from Phase 1; before the post-test.

<sup>c</sup>Experimental and control respondents from Phase 2; after the post-test.

<sup>d</sup>Percent of responses.

<sup>†</sup>Significant difference in the control groups' intent to take action to reduce food tampering ( $p<.05$ ).

Hypothesis ten was retained for the experimental group and rejected for the control group. There was a significant difference between the intent to take action to reduce food tampering hazards before and after the post-test for the control group ( $p=.00$ ). There was not a significant difference for the experimental group; however, values approached significance ( $p=.06$ ). The change in intent to take action increased for both the experimental and control groups. Because the percentage of change for the groups was so comparable, this finding might be most directly attributed to the effect of the

post-test. The respondents may have recognized key points to reduce food tampering contained on the inspection form and identified that they could be used to modify their self-serve food production and serving without having to make drastic and expensive changes within their foodservice operation.

H<sub>0</sub>11: There is no significant difference between the experimental and control groups' intent to implement in-house inspections before and after the post-test.

The purpose of hypothesis eleven was to discover if the Phase 2 instruments, workbook and post-test, changed the respondents' intent to use in-house inspections as a part of a food tampering reduction effort. Question 9-b of the questionnaire and question 6 of the post-test for experimental and control groups were compared by Chi square. Respondents indicated whether or not they would make each of the specific changes to reduce food tampering. Respondents could select more than one change from the five choices listed.

The experimental and control groups initially were similar. Chi square analysis of the groups' responses to the Phase 1 question indicated that there were no significant differences in their intent to make any of

the changes listed. Their responses are summarized in Table 38.

Table 38

Changes considered by experimental and control groups to reduce food tampering hazards in their foodservice facilities reported before and after the post-test<sup>a</sup>

Intended changes	Exp.1 <sup>b</sup>		Con.1 <sup>b</sup>		Exp.2 <sup>c</sup>		Con.2 <sup>c</sup>	
	No. <sup>d</sup>	% <sup>e</sup>	No.	%	No.	%	No.	%
Use in-house inspections	81	92	86	93	102	92	94	90
Quit self-serve	20	25	24	32	9	9	15	14
Increase supervision	47	60	38	49	29	28	34	32
Change self-serve equipment	61	76	68	81	89	83	82	78
Redesign self-serve	42	55	56	69	63	58	62	61

<sup>a</sup>No significant differences between the experimental and control groups before the post-test for any of the change statements ( $p > .05$ ); no significant differences between the experimental and control groups after the post-test for any of the change statements ( $p > .05$ ).

<sup>b</sup>Experimental and control respondents from Phase 1; before the post-test.

<sup>c</sup>Experimental and control respondents from Phase 2; after the post-test.

<sup>d</sup>Respondents could select more than one response.

There were no significant differences between the groups with respect to reported intent to make changes before the post-test. This finding indicated that the

groups were similar entering Phase 2 and the effect of the workbook and post-test could be more directly determined than if the groups had significant differences. There were no significant differences between the experimental and control groups for any of the changes after the post-test. The percent of the experimental group intending to use in-house inspections remained at 92%; the control group decreased from 93% to 90% after the post-test.

Decreases by both groups were seen in the post-test in the intent to discontinue self-serve; the experimental group decreased from 25% to 9%; control, 32% to 14%. Both groups showed a decrease in the intent to increase labor for supervision of the self-serve food area; the experimental group decreased from 60% to 28%; control, 49% to 32%. The experimental group had an increase from 76% to 83% in intent to buy or modify self-serve equipment; the control group decreased from 81% to 78%. The percent of experimental respondents who considered a change in the design or floor plan increased from 55% to 58%; the control group decreased from 69% to 61%. The post-test seemed to provide information that both groups could use to decrease the risk of food tampering as alternatives to discontinuing self-serve foods. This was also observed for increasing

the amount of labor; while supervision of self-serve areas is important, other factors such as the layout or type of equipment also contribute to safety.

Hypothesis eleven was rejected for the experimental group: there was a significant difference between the experimental group's responses before and after the post-test concerning the intent to implement in-house inspections ( $p=.00$ ). The hypothesis was retained for the control group: there was not a significant difference found ( $p=.13$ ).

The other four change statements were also evaluated; discontinue the use of self-serve foods, increase labor for the supervision of the self-serve food area, buy or modify self-serve equipment, and redesign the self-serve area by changing the floor plan. There was a significant difference before and after the post-test for the control group regarding the change in increasing labor for supervision of the self-serve area. Fewer respondents would increase the labor for supervision in the self-serve area.

Chi square analyses were conducted with question number 9-c (a through e) from the questionnaire and question number 6-a (a through e) from the post-test. The purpose of the cross-tabulation was to identify if the experimental or control groups showed significant

changes for any of the change statements after the post-test. Responses are summarized in Table 39.

Table 39

Changes considered by experimental and control groups to reduce food tampering hazards in their foodservice facilities compared to Phase 1 responses

Intended changes	Exp. 1 <sup>a</sup>		Exp. 2 <sup>b</sup>		Con. 1 <sup>a</sup>		Con. 2 <sup>b</sup>	
	No. <sup>c</sup>	% <sup>d</sup>	No.	%	No.	%	No.	%
Use in-house inspections	75	92	77 <sup>1</sup>	94	78	93	77	92
Quit self-serve	18	25	4	6	23	34	9	13
Increase supervision	42	59	23	32	33	48	24 <sup>2</sup>	35
Change self-serve equipment	58	80	67	92	62	82	61	80
Redesign self-serve	38	56	44	63	49	70	49	70

<sup>a</sup>Experimental and control respondents from Phase 1; before the post-test.

<sup>b</sup>Experimental and control respondents from Phase 2; after the post-test.

<sup>c</sup>Respondents could select more than one response.

<sup>d</sup>Percent of responses.

<sup>1</sup>Significant difference in the experimental groups' intent to use in-house inspections before and after the post-test ( $p < .05$ ).

<sup>2</sup>Significant difference in the control groups' intent to change increased supervision after the post-test ( $p < .05$ ).

The final question that appeared on the post-test for both the experimental and control groups was an

open-ended question that asked, "Is there anything you would like to say about food tampering in foodservice?" There were 52 responses; 25 from the experimental group and 27 from the control group. The responses are listed in Appendix I. In general, responses were positive. Ten respondents expressed thanks for the materials and stated their plans to use the information for employee training. One respondent stated that food tampering prevention was an obligation for customer safety. Concerns were also expressed. Several respondents remarked how difficult they thought it was to stop food tampering if an individual was determined to tamper. Other comments included concern about food tampering occurring at the distribution level, by vendors or employees. Four expressed concern for the vulnerability of self-serve foods. A timely concern was that non-commercial facilities were reducing labor due to budget cuts which could result in less monitoring of the foods and an increased chance for food tampering.

#### Summary of Phase 2 Results

The sample consisted of respondents from commercial and non-commercial foodservice operations that had self-serve foods. Respondents were divided into experimental

and control groups. The experimental group received the workbook and post-test; the control group received only the post-test. Responses recorded on the post-test were statistically analyzed by Chi square and the t-test. The purpose of the testing was to determine what changes, if any, resulted from the experimental and control groups' experience with the workbook and post-test.

Eleven null hypotheses were tested. Hypotheses one through seven were used to test the workbook and the post-test of Phase 2. Hypotheses eight through eleven tested comparisons between responses of Phase 1 and Phase 2. The summary of the eleven hypotheses follows.

H<sub>0</sub>1: there was a significant difference between the experimental and control groups' ability to identify possible food tampering hazards through floor plan evaluation ( $p=.01$ ). More of the experimental group could correctly identify floor plan designs with food tampering risk potential. The workbook was effective in producing a knowledge change.

H<sub>0</sub>2: there was no significant difference between the experimental and control groups' level of concern for food tampering in their foodservice facilities ( $p=.99$ ). Both groups had increased levels of concern after the post-test as compared to the Phase 1 levels.



H<sub>0</sub>3: there was no significant difference between the experimental and control groups' report of change in the level of concern after the post-test ( $p=.73$ ). However, both groups had greater concern after the post-test than before.

H<sub>0</sub>4: there was not a significant difference between the experimental and control groups' opinion that in-house inspections would help reduce food tampering ( $p=.90$ ).

H<sub>0</sub>5: there was not a significant difference between the experimental and control groups' understanding of a HACCP principle ( $p=.64$ ). The question used to test this hypothesis may not have been an effective measure of knowledge change.

H<sub>0</sub>6: there was not a significant difference between the experimental and control groups' intent to take action of the possibility of food tampering was found in their facility ( $p=.14$ ). However, 97% of each group would make changes to reduce the risk. The response for intent to take action and make changes to reduce risk was high for both groups before the post-test.

H<sub>0</sub>7: there was no significant difference between the experimental and control group' mean tamper value score. Both groups evaluated their facilities in a

consistent manner. Eleven sections were scored in the in-house inspection part of the post-test. There was a significant difference between the experimental and control groups in only one section; food inspection during service. A larger number of the experimental group had more frequent, or routine, inspections.

H<sub>0</sub>8: there was a significant difference in the level of concern for food tampering occurring in both the experimental and the control groups' foodservice facilities before and after the post-test ( $p=.00$  and  $.01$ ).

H<sub>0</sub>9: there was no significant difference before and after the post-test in the experimental groups' opinion that in-house inspections could help reduce food tampering ( $p=.80$ ); there was also no significant difference found for the control group ( $p=.19$ ).

H<sub>0</sub>10: there was no significant difference in the intent to take action to reduce food tampering hazards for the experimental group before and after the post-test; however, values approached significance ( $p=.06$ ). There was a significant difference found for the control group ( $p=00$ ). A larger number of both experimental and control respondents indicated that they would make changes to reduce food tampering hazards on the post-test.

H<sub>0</sub>11: there was a significant difference in the experimental groups' intent to implement in-house inspections before and after the post-test ( $p=.00$ ); there was not a significant difference for the control group ( $p=.13$ ).

There were fewer statistically significant differences between the experimental and control group responses than between the Phase 1 and post-test responses. Both the experimental and control groups changed after the post-test as compared to Phase 1 responses.

The food tampering hazard inspection form was the first part of the post-test encountered by the respondents. The experimental and control groups responded very similarly to their facility self-assessment, as evidenced by the recorded tamper value scores. This finding could indicate that the form was self-explanatory and the respondents were able to consistently use the form. Another reason could be that the foodservice facilities of the respondents were similar in design; however, there is diversity in the floor plans used in the foodservice industry. Because there are many different types of facility designs, each facility in the study would have to have been inspected by the same individual, or individuals who had received

the same training, to be more assured of consistency and to verify the respondent's assessment. However, the facility assessment form was validated within the pilot test to determine the level of assessment agreement between pilot study participants and the investigator. More likely, the responses could be attributed to similarities in management related to concern or interest in food safety standards. Concepts of safe food handling and serving were integrated into the assessment form. There is the possibility that the scores represented the respondents's management policy on food safety rather than what was actually occurring in the foodservice. This could have resulted in the consistently positive tamper value scores.

The study was successful in increasing the awareness and concern of participating foodservice managers to food tampering. Managers also reported that they would make changes in their foodservice facilities to reduce food tampering hazards. A food tampering hazard self-instructional workbook and food tampering hazard inspection form were developed for managers which are applicable to different types of foodservice facilities. These tools were designed to be used without an instructor present.

### Strengths and Limitations

The natural settings of the facilities served both as a challenge and a benefit to the study by testing the instruments in environments which varied widely. There were variables associated with the foodservice managers and within the environment of the foodservice facilities which were not controllable. The qualifications, both educational and professional, of the foodservice manager were not controlled. Those variables could have influenced the ability and motivation of the respondent to read the workbook and complete the facility assessment form. The use of the self-instructional materials was not controlled; respondents may have completed the post-test before reading the workbook which could have resulted in inaccurate responses. The respondent's reported intent to make foodservice facility changes to reduce food tampering risks could have depended on factors which included the budget and financial state of the organization, constraints of the equipment currently in use, and the authority of the participant to initiate changes, rather than on the need identified.

The study had strengths in several areas which included diversity and size. Diversity of the types and

locations of foodservice facilities and characteristics of the managers was desirable and helped to generate a broad base of information. The study was wide in scope: questionnaires were distributed to 1000 foodservice managers who were employed in commercial and non-commercial foodservice operations. Commercial and non-commercial foodservices were used to gain a perspective into a cross-section of the industry. All fifty states were represented, which provided a national rather than regional perspective. A publicized incidence of food tampering had occurred in Oregon so the study was designed to extend beyond the Pacific Northwest to reduce the likelihood of bias.

The study was strengthened by the use of Dillman's tested procedures for mail surveys, including questionnaire design and implementation, which can produce response rates of 60% or higher (95). Self-administered questionnaires did not require interviewers and were appropriate for a survey of this magnitude. The response rate was satisfactory for Phase 2 but limited for the commercial sector in Phase 1. A larger percentage of non-commercial foodservice managers responded in both phases than commercial foodservice managers. In Phase 1 the combined response rate for the commercial and non-commercial groups was 54%: 71% for

the non-commercial; and 37% for the commercial. For Phase 2 the combined response rate of the experimental and control groups was 66%: 53% of the commercial group returned usable post-tests; 65%, non-commercial. Of the initial 1000 contacts, 314 out of 500 non-commercial and 62 out of 500 commercial managers completed the study with usable questionnaires and post-tests. Therefore, the findings of the study were generalizable to the foodservice managers in non-commercial foodservice facilities with greater confidence than to the managers in the commercial sector of the industry.

Limitations of the study which were identified dealt with sample bias and research design. A possible bias of the population from which the sample was selected was acknowledged. Individuals and foodservice facilities which have membership in the NRA, NACUFS, and/or ASHFSA have access to professional networking, association-sponsored resources, educational programs, information libraries, trade or professional journals, and other publications. Non-members might not have the ease of access to similar resources. The membership might represent managers or foodservice facilities who were in a financially stronger position than non-members. This might be evidenced by the member's ability to pay the cost of membership. Membership could

also represent those individuals or organizations who valued continued learning opportunities. Therefore, membership in one of the organizations could indicate a larger, more financially secure foodservice organization with managers having more interest in education and resources to improve the business than non-members. Therefore, some of the smaller foodservice operations, especially in the commercial sector, would have less chance of being represented in this study.

A post-test only control group design was used for the experimental portion of the study. The omission of a pre-test eliminated the likelihood of the interactive effects of pre-testing (81). However, the Phase 1 questionnaire seemed to have the effect of a pre-test. The questionnaire may have increased the foodservice managers' awareness and concern about food tampering. The control group changed as a result of the food tampering information and awareness provided by the process of completing the questionnaire. Therefore, the control group was not the same as a control group which had not experienced the questionnaire. A similar effect occurred for the experimental group. Both groups in Phase 2 had exposure to the suspected pre-test effects of the Phase 1 questionnaire. This could have contributed to the finding that significant differences



were more evident when before and after post-test responses were analyzed than differences between the experimental and control groups.

The experimental group which had the self-instructional workbook did not differ significantly from the control in several sections of the post-test. There are at least two possible explanations. First, since there were few significant differences between the groups after the post-test, the post-test may have functioned as an educational tool which, in addition to the Phase 1 questionnaire, also increased the respondents' awareness of food tampering. Reducing the educational content of the post-test by removing the food tampering hazard self-inspection form and eliminating the questionnaire might have resulted in a greater difference between the experimental and control groups.

Secondly, nearly one-half of the respondents read less than 75% of the workbook. It is not easy to motivate individuals by instructional materials in written form (72). Because the workbook was self-instructional, foodservice managers needed a high level of motivation to learn. There was no opportunity for an instructor to direct the managers to identify possible values gained by reading and completing the workbook.

Ribler defined motivation as "an internal force that leads to establishment of satisfaction of some felt need by the individual" (75, page 4). The reading of the workbook was dependent on the strength of the motivation and the strength of the incentive (75). No monetary reward or incentive for reading the workbook or completing the post-test was offered in Phase 2. The potential gain to the foodservice managers was the opportunity for new knowledge which could be applied to their foodservice facility. They did receive a copy of the workbook and the inspection form for reference. Perhaps if foodservice managers felt that their facility was not at risk for food tampering, they were less interested in reading the workbook and conducting the inspection.

There are limitations to the use of questionnaires. Survey results cannot be absolute because responses rely on the wording of questions; slightly different wordings can yield results which vary (91). Surveys are also dependent on the cooperation of the respondents; responses may be insincere or careless, especially if the survey is too long (93). When information is requested of respondents which may be considered secret, such as the food tampering risk within their facilities or the actual occurrence of tampering, they may respond

to minimize the characteristics held in low esteem by society (93). However, the instruments were reviewed by an expert panel and pilot tested to eliminate unclear or ambiguous wording, determine length, and provide ease of use for respondents.

The study did not include a follow-up of the foodservice managers to the stage of implementing changes to reduce food tampering risk. Therefore, changes in their behaviors or actions regarding food tampering were not determined. Their reported intent to make changes to reduce food tampering risk may or may not have resulted in actual improvements.

Different approaches might be tested in subsequent studies to increase the effectiveness of the workbook. One technique which might increase motivation would be to have an instructor present who could help to direct the managers. Instead of a self-instructional workbook with no contact between the author, there could be interaction between the foodservice managers and the instructor in a more controlled learning environment. An instructor could go to the foodservice managers and teach them within their foodservice facilities. Another approach would be to use a controlled instructional environment, such as in a classroom or as a structured part of a workshop. There would be the opportunity for

interaction and group activities among the managers in these settings.

The instructional format of the workbook might be changed to help increase the effectiveness of the information transfer. Media enhancement could accompany the workbook, such as slides or a video which would lead the participants through the facility food tampering hazard self-assessment process. The workbook was developed using theories which related to the development of training manuals, self-instruction, and the on-the-job training technique called learner controlled instruction (LCI). The workbook and supporting materials could be incorporated into a LCI environment which could strengthen the effectiveness of information transfer to foodservice managers (78). Adequate time and motivation to complete the workbook should be provided prior to post-testing.

Another approach would be to change the content of the workbook by making it more informative. There are both positive and negative aspects to this potential change. A positive outcome of increasing the amount of information in the workbook would be that foodservice managers might develop a deeper understanding of the ways foods can be contaminated through tampering and methods to reduce the risk of tampering. Important

concepts in the HACCP system could be reinforced with more detailed information and examples but this would take a larger amount of the manager's time. The HACCP system of hazard assessment is not a project which should be rushed, so the workbook activity number three, Food Charting, should be maintained and emphasized.

The negative aspect of increasing the information and detail is the amount of time required for foodservice managers to read and complete the workbook. The workbook was planned using criteria developed for the study which assumed foodservice managers had very limited time. The workbook was designed to be read in approximately thirty minutes or less. The self-instructional method might not be appropriate for a more detailed workbook; the presence of an instructor could help the foodservice managers. Benefits of the self-instructional method which include reaching a large group of foodservice managers at one time for instruction and the savings in instructional cost and time would not be realized.

Another approach would be to use the post-test without the inspection form section. This would help to determine changes in concern, opinions, and knowledge resulting from the workbook without the educational input of the form. The process of foodservice facility

evaluation for food tampering hazards could be incorporated into the workbook as the final exercise. The form would be used without modifications to content or format.

The design of the study could be modified. Now that the baseline demographic data and data relating to opinions and awareness of foodservice managers to food tampering have been collected, the workbook and post-test could be given to a sample without the initial questionnaire. The absence of the questionnaire would eliminate the effects of a pre-test. Demographic questions and those relating to the foodservice manager's awareness and opinions of food tampering which were developed for the questionnaire could be used in the post-test to gain information about the sample. The foodservice managers participating in the study would be divided into experimental and control groups. The workbook and the post-test would be given to the experimental group; the control group would receive only the post-test.

An alternative design involves conducting the study on a smaller scale by utilizing a sample within a state or region instead of the entire nation. The investigator would be involved with each manager throughout the study. The foodservice managers would

receive instruction on the concepts of food tampering, hazard reduction, and food tampering hazard evaluation for their facility by the investigator and utilize the workbook. The investigator would visit each facility, conduct an evaluation using the inspection form, and identify if the evaluations are being done consistently. This design provides the opportunity to determine if the workbook and inspection form meet the needs of the managers or if modifications are needed.

Finally, an addition to this study would be the follow-up of foodservice managers in six months to one year. Respondents would be contacted to determine if they actually implemented changes to reduce food tampering hazards. Changes could include redesigning the floor plan of the self-serve area, obtaining or modifying self-serve equipment, increasing supervision of the self-serve foods, or implementing in-house inspections. An estimated time of least six months would be needed if structural modifications or equipment replacements were made. This follow-up would also be a measure of the effectiveness of the initial study.

### Implications for Education and Practice

Food safety programs targeting food tampering hazard assessment or reduction have not been identified through the literature. Although the HACCP system has been applied to different types of food systems, no documentation was found directly relating HACCP systems to food tampering at the level of food consumption within foodservice facilities.

Food tampering prevention education has not been provided to commercial and non-commercial foodservice managers. This finding was supported by review of the literature, personal interviews with an officer and staff member of national foodservice organizations, and previous studies conducted with dietetic educators.

The findings of this research can be applied to the educational and practice environments. Practitioners can use the food tampering hazard reduction information to assess food tampering risk in their foodservice facilities. Different levels of food safety considerations could be applied, from menu analysis and food item modification to food handling and storage procedures, to serving practices. Concepts of risk reduction can be applied to facility design planning for new construction or the remodelling of existing



operations. The educational workbook and food tampering inspection form developed for Phase 2 can be used for employee in-service training. Practitioners can use both the workbook and form as the basis of a self-serve food protection program or customize them to meet their individual operations.

The contents of the workbook and inspection form could become the basis for an instructional video. The video could be used by managers to increase the awareness of their employees of food tampering and instruct them in the food tampering hazard inspection process. The information could become part of their food handling or food safety instruction.

Managers who are familiar with HACCP systems should be able to apply these concepts to food tampering prevention. If they are confident using the HACCP system and apply the concepts within the foodservice arena, integration of a food tampering prevention program could easily occur. A food tampering prevention program needs to meet several criteria for it to be accepted and practiced within foodservice facilities; the information for the monitoring system must be quickly and easily obtainable; the program must take a minimum of time; routine observations can be conducted

by trained employees; and cost should be realistic for the organization.

The food tampering prevention process may not need to be as formalized as the HACCP system to result in benefit to the organization; it may not be distinct from good food safety and management procedures. Employees could be instructed how to observe and handle suspicious customers, deal with suspect foods, and observe foods for evidence of tampering at each step of production, handling, and service.

Sanitarians who work closely with the foodservice industry might find the food tampering information useful. The inspection form could be a part of their evaluation process when inspecting foodservice facilities. At this time their role would be to educate foodservice managers about this aspect of food safety rather than to regulate. Sanitarians could distribute food tampering prevention information to large numbers of foodservice managers and facilities.

For educators, the information from this study can be used to develop more comprehensive academic programs involving food safety and food management issues. Concepts related to the HACCP system can be introduced and developed at different levels of student interests and abilities including associate degree education,

undergraduate or graduate studies, and professional credentialing. Because a large number of respondents had studied dietetics, this topic could find use in The American Dietetic Association didactic and internship programs. The most likely application would be in the food management component of the dietetic education program. Dietitians employed in clinical practice should be aware of the possibility of tampering with supplemental feeding. Persons responsible for providing continuing education programs to members of professional associations can use findings of this study for determining programs or topics appropriate for the participants.

Food tampering awareness and prevention could be integrated into academic curricula in courses with content including food safety, food management, or facility design. HACCP systems are now being used in some foodservice operations and could also be part of food management education programs. Workshops or in-service programs could be sponsored by health departments or trade and professional organizations which represent the membership of foodservice managers. Motivation to participate might be enhanced by offering continuing education credits.

### Implications for Future Research

Future research is needed to more fully understand food tampering and the successful application of control procedures. Customers like to serve themselves and this results in managerial and operational challenges to protect the foods. There is a need for equipment which can more adequately protect self-serve foods. Self-serve equipment with lids or covers that automatically open and then close when the customers have finished serving themselves might be designed. Covers for foods which allow the customers and employees to see foods could be constructed out of clear plastic-type materials that resist scratching, clouding, and are not affected by temperature extremes. Perhaps sensors or probes could be designed that would indicate if products other than the serving utensils were placed in the foods. However, if equipment is to successfully protect the foods, customers must accept and use the equipment. The aesthetics of food service must be also be considered.

The use of security systems such as closed circuit cameras could be investigated. The devices would be placed near the self-serve area to record the activities of customers and employees. If individuals were aware

that surveillance was used the chance of food tampering might decrease.

The use of robotics in foodservice operations has been investigated. Continued research into foodservice tasks applicable to robotics needs to occur. If robots were accepted by customers, the self-service of foods could be mechanically assisted. Customers would make their selections from the self-serve offerings and a robot would serve the food. The robot could be a voice activated arm-like device that responds to the customer's request. Initially this concept might be applied to a setting where the portioned food is pre-plated and then served by the robot. Both portioning and service by the robot might evolve. Benefits could include reduction of food contamination by humans, increased speed of service, and a marketing tool for the foodservice. The cost of equipment and robot acquisition could be a constraint; difficulties in robot cleaning, sanitation, and maintenance should be prevented through the design.

Research into the relationship of floor plan designs and food tampering is needed. Researching floor plan designs of self-serve areas and their incorporation into the foodservice setting which results in the greatest ease of observation is needed. Also, floor

plans which promote the easiest access for maintenance and service by employees could be determined. The aesthetics of display and service must be maximized while achieving floor plans which promote food tampering risk reduction. Several types of foodservice facility floor plans which include the self-serve area could be computer modelled and viewed from different angles to simulate employee observation. Prototypes of the self-serve area floor plan design with equipment could then be constructed and placed in foodservice facilities participating in the study. Evaluation of the prototypes by customers, employees, and managers could be used to further refine the designs.

Research is needed to determine if current regulations applied to foodservice facilities help to protect foods from tampering. Topics of study might include the requirements for the design and use of self-serve equipment and their effect on food tampering risk reduction. Research into the use of plan review requirements and criteria for plan approval prior to construction or remodelling could be undertaken. Studies are needed to determine if HACCP systems or food tampering risk reduction concepts are considered in the plan review process. The effectiveness of plan reviews which include factors to help reduce food tampering risk

could be measured by the number of food tampering incidences or foodborne illnesses associated with self-serve foods which occur in facilities with and without the described plan reviews. More stringent requirements may be needed regarding self-serve equipment, facility design, and plan review, but investigation to verify this is indicated.

Another area of exploration concerns identifying the most effective large-scale method of providing food tampering awareness, education, and prevention programs to foodservice managers. The self-instructional manual has been tried; perhaps a more visual approach such as a video would be effective. Regulatory personnel including sanitarians would benefit from this instruction and be able to use the information in their work with foodservice managers. Part of the instruction should include recognizing human behaviors associated with tampering action. Research regarding the behaviors of individuals who tamper has been conducted in industry. Studies which apply this information to the foodservice environment would be useful to help managers recognize employees who may have tendencies toward tampering or to the work setting which could contribute to the behavior.

## SUMMARY

The potential for food tampering exists within both commercial and non-commercial foodservice facilities in the United States. For the purpose of the study, food tampering was defined as the "intentional contamination of foods by planned human acts for the purpose of causing human illness or injury." Food tampering can result in illnesses to customers and financial losses to the foodservice organization. Food tampering can occur at any stage in the processing and handling of foods; however, when foods are handled by customers, such as self-serve, the potential for contamination is increased. Cases of food tampering have been documented; however, no published food protection programs or facility design studies which are specific to food tampering reduction were found in the review of literature.

The changing nature of service types found in the foodservice industry has resulted in a need for foodservice managers to apply sound principles of food safety and management to their operations. The frequent use and customer demand for self-serve foods has created a challenge for protecting the safety of self-serve foods. Self-serve foods are open to contamination which



may be a result of food tampering by customers.

Foodservice managers need to be aware of the potential for food tampering and have the ability to apply food safety and management skills to protect foods served in their facility.

The purpose of the study was to assess foodservice managers' levels of food tampering awareness and opinions, and to evaluate the effectiveness of a food tampering risk reduction education program based on the HACCP system used by foodservice managers. A questionnaire, food tampering risk reduction self-instructional workbook, and post-test which included a food tampering hazard inspection form were developed and tested. The questionnaire was developed using Dillman's (88) procedures for survey research as a guide. The workbook was based on principles of the HACCP system and constructed as a self-instructional workbook (72). The post-test contained a food tampering hazard inspection form and a brief questionnaire to test the effect of the workbook. The instruments were evaluated by an expert panel and then pilot tested.

The research was conducted in two phases. The objectives of Phase 1 were to determine the awareness and opinions of foodservice managers regarding food tampering, to obtain demographic information about the

respondents and the facilities which they represented, and to acquire the population for the second phase of the study. Phase 1 data were collected by a survey questionnaire mailed to 1000 foodservice managers who represented both commercial (n=500) and non-commercial (n=500) foodservice operations throughout the United States. The overall response rate was 54%; the non-commercial rate was 71%; commercial, 37%. The 536 returned questionnaires were evaluated for the use of self-serve foods; 72% (n=376) of the respondents had self-serve foods and were contacted for continuation with Phase 2.

The analyses and examination of the data collected from foodservice managers in commercial and non-commercial foodservice operations in Phase 1 produced information about managers' opinions and actions toward food tampering in foodservice facilities. Demographic characteristics about the managers and their foodservice facilities were also obtained. The data were analyzed by frequency distributions and chi square testing at the significance level of  $p \leq .05$ .

The findings of Phase 1 follow. Health care dominated the non-commercial facilities while restaurants represented the majority of the commercial foodservice facilities. The non-commercial facilities

were located in significantly smaller population areas than the commercial; the non-commercial facilities served significantly greater numbers of customers.

There were significant differences in the educational background of the commercial and non-commercial foodservice managers: more managers of non-commercial foodservice facilities had college degrees; the largest number of managers represented non-commercial facilities and studied dietetics; and the majority of commercial managers had on-the-job foodservice-related education.

There were no significant differences between the commercial and non-commercial foodservice managers' awareness of food tampering; awareness was low for both groups. The majority of respondents expressed concern about food tampering but managers of foodservices with self-serve foods expressed greater concern than those without self-serve. Significantly more non-commercial foodservice facilities had self-serve foods. Respondents who were more aware of food tampering were also more concerned. Concern of food tampering increased as the size of the facility increased; more foodservice managers in urban areas expressed concern than rural.

There was no significant difference between commercial and non-commercial managers' use of HACCP systems. The majority of managers did not use HACCP systems; however, the majority did use in-house inspections.

For Phase 2, the treatment tool, a self-instructional workbook, and the post-test were mailed to the experimental group. The control group received the post-test. The overall response rate was 66% (238 usable responses). Responses to the post-test were analyzed using chi square and the t-test at the significance level of  $p \leq .05$  to determine the effectiveness of the food tampering risk reduction self-instructional workbook (treatment), and the food tampering self-inspection form with questionnaire (post-test). The results of the data analyses for the eleven hypotheses produced information about respondents' opinions and perceived risk of food tampering, actions regarding food tampering, and changes in response to the instruments tested.

Post-test responses were compared for the experimental and control groups. The workbook was effective in producing a knowledge change: significantly more of the experimental group correctly identified tampering hazards associated with floor plans. However,

no significant differences were found between the groups with respect to food tampering concern or change in concern, use of in-house inspections to reduce risk, or intent to take action to reduce risks. Of interest was the finding that both groups had increased levels of concern after the post-test, and 97% of both groups would make changes to reduce risks. The question regarding a HACCP principle may not have accurately measured knowledge change. The t-test was used to compare the experimental and control groups' mean scores on the food tampering hazard self-inspection form. There was no significant difference between the means for the groups. Of the eleven sections composing the food tampering hazard self-inspection form only one section, food inspection during service, was significantly different for the groups; the experimental group reported more frequent inspections.

Responses to the questionnaire and the post-test were compared for the experimental and control group respondents. Food tampering concerns for both the experimental and control groups significantly increased after the post-test. No significant differences were found in either groups' opinion that in-house inspections could reduce food tampering risk; however, the experimental groups' reported intent to implement

in-house inspections increased significantly while the control group's intent did not.

The results of the total study provide information concerning the foodservice managers' current levels of awareness and concern towards food tampering and their willingness to take steps to help minimize food tampering hazards associated with self-serve foods in their operations. Findings indicated that increased awareness resulted in increased concern for food tampering. Therefore, by communicating food tampering risk reduction information to foodservice managers, they may become more aware of the potential and be receptive to making operational changes to reduce the risk.

Strengths and limitations of the study were identified. Strengths included the diversity of the sample and scope of the study. The sample was composed of 1000 foodservice managers with diverse characteristics who represented commercial and non-commercial foodservice facilities located in each of the fifty states. The use of tested mail survey procedures strengthened the study and resulted in an adequate response rate for Phase 2.

Several limitations were identified relating to population bias and research design. A possible population bias was acknowledged; all foodservice

managers or facilities were members of at least one national organization (NRA, NACUFS, and/or ASHFSA) which represented the foodservice industry. A post-test only design was used, but the Phase 1 questionnaire may have had the effect of a pre-test. Motivation for the managers to complete the workbook was not high. Nearly one-half of the foodservice managers read less than 75% of the workbook, which made evaluation of its effect less defined. There are limitations to the use of questionnaires.

Alternative research designs could be tested which might more clearly define the value of the workbook. The questionnaire used in Phase 1 could be deleted which would eliminate the effect of a pre-test. The post-test could be given without the inspection form to reduce the educational effect of the post-test. Educational methods other than self-instruction might be used to test the effectiveness of the information presented in the workbook. A follow-up of foodservice managers several months after completion of Phase 2 could be incorporated into the design in order to determine if managers actually made changes to their facilities to reduce food tampering hazards. The scope of the study could be reduced to a state or regional level so that the investigator could be directly involved with the

instruction of each manager. A facility inspection made by the investigator could then be compared to the manager's inspections for consistency. The workbook and inspection form could be evaluated on site and modified to more adequately meet the needs of the managers.

The findings of this study can be applied to education and practice. Foodservice managers can use the workbook and inspection form as a basis for a food safety program aimed at reducing food tampering hazards. Media enhancements including video presentations could be developed using the workbook and inspection form as a basis of information. Professional or trade associations could utilize the concepts for continuing education for their members or as a topic for educational meetings or conferences. Managers who are already familiar with HACCP systems could integrate food tampering hazard prevention programs into their existing food safety programs. Sanitarians who work with the foodservice industry could use this information to help foodservice managers reduce food tampering hazards in their facilities.

Educators of students in dietetics, food management, or culinary arts programs could integrate the principles of food tampering prevention and the



HACCP system into courses dealing with food procurement and production, handling and serving, and facility planning. Students who are aware of the possibility of food tampering could increase the awareness of their future employing organizations and lead the way to change for safer foods.

Research beyond this study is needed to help prevent food tampering within foodservice facilities. Several research areas have been identified. Self-serve equipment which can more effectively protect food than that currently available is needed. The potential exists for the application of robotics to self-serve foods to reduce opportunities for human contamination. Research into the relationship of foodservice facility design and food tampering prevention is needed. The use of computer simulations and modelling could be used in the process of design evaluation. The effects that current foodservice regulations and the foodservice facility plan review process have on reducing food tampering is a field to explore. An additional area of research is to identify the most effective means of conducting a large-scale food tampering awareness, education, and prevention program for foodservice managers and sanitarians involved with foodservice.

This study was effective in the development of two instruments, a food tampering hazard self-instructional workbook and a food tampering hazard inspection form, which are applicable to foodservice facilities and can be used by foodservice managers in the absence of an instructor. Foodservice managers who participated in the study experienced increased awareness, concern, and intent to make changes within their facilities to reduce food tampering hazards.

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## APPENDICES

APPENDIX A

Excerpt from Dale-Chall Readability Testing  
Conducted on Workbook

SAFE  
 BY LOOK  
 PASSAGE 3

CUSTOMERS AND EMPLOYEES USE THE FRONT SIDE ONLY. EMPLOYEES FILL FOOD FROM THE FRONT OF UNIT. CUSTOMERS BACKS ARE SEEN WHICH MAKES IT A PROBLEM TO SEE HOW THEY HANDLE FOOD. IT MAY BE HARD FOR #MANAGEMENT TO OBSERVE AND SERVICE FILL AND CLEAN THE AREA DURING BUSY TIMES. ESTIMATED FOOD TAMPERING HAZARD IS GREATER THAN PLAN #2 PLAN #3 OR PLAN #4. ISLAND STYLE SELF SERVE. CUSTOMERS USE BOTH SIDES OF THE SELF SERVE UNIT. EMPLOYEES FILL FOOD FROM THE FRONT OR BACK. IT MAY BE HARD TO OBSERVE OR SERVICE THE AREA DURING BUSY TIMES. ESTIMATED FOOD TAMPERING HAZARD IS GREATER THAN PLAN #3 OR PLAN #4.

3 CUSTOMERS	1 AND	1 SIDES	1 OF
3 EMPLOYEES	1 USE	1 THE	1 SELF
1 THE	1 FRONT	1 SERVE	2 UNIT
1 SIDE	2 ONLY	3 EMPLOYEES	1 FILL
3 EMPLOYEES	1 FILL	1 FOOD	1 FROM
1 FOOD	1 FROM	1 THE	1 FRONT
1 THE	1 FRONT	1 OR	1 BACK
1 OF	2 UNIT	1 IT	1 MAY
3 CUSTOMERS	1 BACKS	1 BE	1 HARD
1 ARE	1 SEEN	1 TO	2 OBSERVE
1 WHICH	1 MAKES	1 OR	2 SERVICE
1 IT	1 A	1 THE	3 AREA
2 PROBLEM	1 TO	2 DURING	2 BUSY
1 SEE	1 HOW	1 TIMES	4 ESTIMATED
1 THEY	2 HANDLE	1 FOOD	3 TAMPERING
1 FOOD	1 IT	2 HAZARD	1 IS
1 MAY	1 BE	2 GREATER	1 THAN
1 HARD	1 FOR	1 PLAN	1 #3
3 #MANAGEMENT	1 TO	1 OR	1 PLAN
2 OBSERVE	1 AND	1 #4	
2 SERVICE	1 FILL		
1 AND	1 CLEAN		
1 THE	3 AREA		
2 DURING	2 BUSY		
1 TIMES	4 ESTIMATED		
1 FOOD	3 TAMPERING		
2 HAZARD	1 IS		
2 GREATER	1 THAN		
1 PLAN	1 #2		

PASSAGE 3

228

NUMBER OF SENTENCES:	10
NUMBER OF WORDS:	109
NUMBER OF SYLLABLES:	155
WORDS OF 6 OR MORE LETTERS:	24
3 OR MORE SYLLABLE WORDS:	13
% OF 3 OR MORE SYLLABLE WORDS:	11.9
AVERAGE SENTENCE LENGTH:	10.9
AVERAGE LETTERS PER WORD:	4.3
AVERAGE SYLLABLES PER WORD:	1.4

THERE ARE 23 WORDS NOT IN THE DALE-  
CHALL WORD LIST. CORRECTED DALE-CHALL  
GRADE LEVEL: 9TH-10TH GRADE.

\*\*\* TOTALS \*\*\*

NUMBER OF SENTENCES:	37
NUMBER OF WORDS:	321
NUMBER OF SYLLABLES:	458
WORDS OF 6 OR MORE LETTERS:	101
3 OR MORE SYLLABLE WORDS:	44
% OF 3 OR MORE SYLLABLE WORDS:	13.7
AVERAGE SENTENCE LENGTH:	8.7
AVERAGE LETTERS PER WORD:	4.8
AVERAGE SYLLABLES PER WORD:	1.5

THERE ARE 80 WORDS NOT IN THE DALE-  
CHALL WORD LIST. CORRECTED DALE-CHALL  
GRADE LEVEL: 11TH-12TH GRADE.

APPENDIX B

Cover Letter, Guidelines, and Questions for Mailing One;  
Expert Panel Members;  
Cover Letter and Summary of Revisions for Mailing Two;  
Letter of Appreciation to Expert Panel Members

(OSU Letterhead)  
(First Mailing to Expert Panel Members)

November 22, 1991

(Name of panel member)  
(Title)  
(Organization)  
(Address)  
(City, State Zip code)

Dear (Panel Member):

Thank you for agreeing to participate as an Expert Panel Member for the research study "Food sabotage risk reduction in foodservice facilities". For this study, food sabotage is defined as the "intentional contamination of foods for the purpose of causing human illness or injury". Accidental contamination of foods, when the offender is not malicious in intent, can also occur. Food sabotage can occur at numerous points in the food chain. This study focuses on the safety of self-serve foods offered in the customer service area of foodservices, both commercial and non-commercial.

The purpose of this study is to help control food sabotage hazards, thereby improving the protection of customer's health and the investment of the foodservice owner. Three instruments will be used. They will be sent to commercial and non-commercial foodservice organizations nationwide. Please note that the term, "sabotage," does not appear in the instruments. Investigators felt that "sabotage" might lead to some resistance to answering questions. Therefore, the term, "tampering", is used. The same definition is used for both terms.

The three instruments are as follows. The first is a questionnaire to assess the opinions of foodservice managers about food tampering and obtain a demographic profile of the respondents. The second is a food tampering information notebook. The third instrument is a food tampering hazard evaluation tool in the construct of a facility self-inspection form.

Samples of the three instruments are enclosed. They are in draft form awaiting your input. I've included questions for each of the instruments, if you wish to use them. Your evaluation will be used to modify the



instruments. Please feel free to make comments beyond the stated questions.

General guidelines:

1. Please make written comments on each of the instruments. Evaluation sheets are included and can be used if they are of help. Please keep the instruments and your comments for reference during the conference call.
2. A conference call will be scheduled for Friday, December 13, at 11:00 a.m. pacific time (2:00 p.m. eastern). During this call you will have the opportunity to talk with other panel members about the evaluation. A recorded/written documentation of the comments will be made during the call.

Please return your comments by mail postmarked by December 9, 1991. If it is more convenient for you, information may be faxed to number (503)-737-6914, College of Home Economics, Oregon State University.

3. Your written comments on the evaluation forms and verbal comments from the conference call will be used to improve the instruments. The revised instruments will be mailed back to you within two weeks for your review and evaluation.
4. I will make individual follow-up telephone calls to each panel member to confirm or clarify changes made to the revised instruments which were mailed back to you. Calls will be made within two weeks after mailing the revised instruments.

Thank you so much for your assistance! I'll be looking forward to your expert opinions.

Sincerely,

Vicki Look, MS, RS, RD  
Project Director

(Questions in dissertation format)

**Questionnaire COVER LETTER Evaluation:**

Please circle or check the YES/NO for each question. Space is provided for comments.

- |    |   |     |    |
|----|---|-----|----|
| 1. | Does the letter create interest in the subject and motivate participants to complete the questionnaire?<br><u>comments:</u> | YES | NO |
| 2. | Is enough information provided to introduce the study and indicate usefulness of the study?<br><u>comments:</u>             | YES | NO |
| 3. | Is the information written without biasing the participant to food tampering?<br><u>comments:</u>                           | YES | NO |
| 4. | Changes you would suggest in content or format.<br><u>comments:</u>   |     |    |

Other comments:

**QUESTIONNAIRE Evaluation:**

I am interested in your evaluation of the general impression given to the reader by the questionnaire, as well as the construction of questions. Please evaluate the instrument with that criteria in mind.

- |    |   |     |    |
|----|---|-----|----|
| 1. | Do each of the questions seem to measure what is intended to measure?<br><u>comments:</u>   | YES | NO |
| 2. | Are all of the words understandable, or clear definitions provided?<br><u>comments:</u><br>(If NO, please list)                                   | YES | NO |
| 3. | Do the close-ended questions have one answer which seems to apply to each participant? Any groups or classifications missing?<br><u>comments:</u> | YES | NO |
| 4. | Is a positive impression given by the questionnaire which would encourage participants to respond?<br><u>comments:</u>                            | YES | NO |
| 5. | Are there any parts of the questionnaire which you feel are biased?<br><u>comments:</u><br>(If YES, please list)                                  | YES | NO |

- |     |   |     |           |
|-----|---|-----|-----------|
| 6.  | Are the questions clearly written and easy to understand?<br><u>comments:</u><br>(If NO, please list)   | YES | 234<br>NO |
| 7.  | Is the format clear and easy to follow?<br><u>comments:</u>   | YES | NO        |
| 8.  | Do questions contain ambiguous wording?<br><u>comments:</u><br>(If YES, please list)  | YES | NO        |
| 9.  | Would participants give consistent responses to questions if provided another similar questionnaire? Is the questionnaire reliable?<br><u>comments:</u> | YES | NO        |
| 10. | Please estimate the time you think participants would require to complete the questionnaire.<br>Estimated time: _____                                   |     |           |
|     | Is this a reasonable amount of time?<br><u>comments:</u>  | YES | NO        |

Other comments:

Note: Questions number 1 through 5 adapted from:  
Dillman, D.: Mail and telephone surveys. John Wiley and Sons,  
New York. 1978.

Please note that sections I through III are written at the high school level. The Dale-Chall readability test rated these sections at the eleventh to twelfth grade level. This level was chosen because participants have different educational backgrounds.

- |    |   |     |    |
|----|---|-----|----|
| 1. | Is the format clear?<br><u>comments:</u>  | YES | NO |
| 2. | The notebook has been tested at a reading level of high school, eleventh to twelfth grade for sections I-III. Does it seem clear to read?<br><u>comments:</u> | YES | NO |
| 3. | Are there any confusing terms?<br><u>comments:</u><br>(If YES, please identify)   | YES | NO |
| 4. | Does the notebook give the reader information about food tampering without biasing?<br><u>comments:</u>   | YES | NO |
| 5. | Are the activities meaningful? Do they contribute to the reader's understanding of food tampering?<br><u>comments:</u>  | YES | NO |
| 6. | Please estimate the length of time participants would need to complete the notebook.<br><br>Estimated time: _____   |     |    |
|    | Is this a reasonable amount of time?<br>(If NO, what changes would you make)  | YES | NO |

Other comments:

## FACILITY INSPECTION FORM Evaluation:

1. Is the format easy to follow? YES NO  
comments:
2. Do the questions direct the participant to an accurate evaluation of foodservice, regarding food hazard risk, (through clearly identifiable concepts or situations to observe)? YES NO  
comments:
3. Do you feel that a foodservice manager could assess food tampering hazards by conducting a facility inspection utilizing the inspection form? YES NO  
comments:
4. Could the form be used by supervisory individuals in the foodservice, other than managers, and get equivalent results? YES NO  
comments:
5. Please estimate the length of time participants would need to complete the inspection.  
 Estimated time: \_\_\_\_\_
- Is this time acceptable or realistic for a foodservice manager? YES NO  
comments:  
 (If NO, what changes would you make)

Other comments:

## (Listing of Expert Panel Members)

**Bert Connell**

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Sanitarian  
Benton County Health Department  
530 NW 27th.  
Corvallis, OR 97333  
503-757-6841

(OSU Letterhead)  
(Cover Letter for Second Mailing)

(Name of Expert Panel Member)  
(Title)  
(Address)  
(City, State Zip code)

December 26, 1991

Dear (Expert Panel Member):

Thank you for your expert evaluation on the documents I plan to use for my food tampering research project. I appreciated both your written comments and participation in the conference call.

I have made changes in the documents based on the written comments from all of the panel members as well as our conference call. Changes are summarized on the following pages. The revised documents are enclosed. Please note that when the finalized documents are distributed to the sample, they will be in the format you received in the first mailing. The notebook will be bound and the questionnaire will be reduced in size and in booklet form. The inspection form will most likely be "no carbon required."

I would appreciate if you could review the revised documents to see if changes are acceptable. If you find any concerns I will address them on the next revision.

Thank you so much for your help. I will call you prior to January 15, 1992 for comments.

Sincerely,

Vicki Look



(Summary of Revisions Accompanying Second Mailing)

12-20-91

Summary of revisions for research documents:

**COVER LETTER:**

1. Changed sentence 1, paragraph 1, to be more personal.
2. Included a time frame for return of questionnaire, including reference to prize incentive for timely return.
3. Clarified confidentiality, envelopes numbered and questionnaires separated upon receipt.
4. Deleted reference to sending Food Hazard Inspection Form upon receipt of questionnaire.

**QUESTIONNAIRE:**

1. Clarified response categories for questions 2,4. Added response of "don't know" to question 3.
2. Underlined each in question 6 (for clarity in response)
3. Changed response of "commercial or non-commercial" to "contract or non-contract" in question 13.
4. Changed question 15 to indicate the respondent's perception of location, whether rural or urban.
5. Changed question 17 from "meals served" to "customers/covers served."
6. Deleted optional name/phone response on back cover.

**NOTEBOOK:**

1. Corrected typographical errors in spacing, wording.
2. Corrected statements which included personification, page 3.
3. Clarified instruction for questions, pages 14, 19.

4. Renumbered questions 5-9 to become 4-8.
5. Tried to make page 21 clearer by changing order of statements and providing more instructions.
6. Increased instruction on page 23.
7. Added instructions, rewrote question 1 on page 24.
8. Rephrased paragraph 2, page 26.
9. Deleted reference to S.A.F.E. program on pages 6, 26 per request of National Restaurant Association.
10. Added indication of cost to food testing on page 10.
11. Removed repetition of food serving equipment; added examples on page 9.
12. Changed "sources" to "agents" on page 4.
13. Added "threat" to definition of food tampering.
14. Changed the name of the notebook from SAFE-SERVE to SELF-SERVE FOOD PROTECTION. This is to avoid conflict/confusion with the National Restaurant's two programs: S.A.F.E. and Serve-Safe.

#### **FOOD TAMPERING HAZARD INSPECTION FORM:**

1. Clarified directions and added reference to timely return of form for eligibility in cash prize drawing, page 1.
2. Corrected typographical spacing errors.
3. Changed the names of the Food Tampering Hazard Ratings, page 5.
4. Deleted one response category "not too concerned" to clarify responses, question 2 on page 6.
5. Added food tampering cartoon to cover page to remind them of questionnaire and topic.

(OSU Letterhead)  
(Letter of Appreciation)

(Name of Expert Panel Member)  
(Position)  
(Organization)  
(Address)  
(City, State Zip code)

January 28, 1992

Dear (Expert Panel Member):

Thank you for serving as an expert panel member for my research study of the possible food tampering hazards associated with self-serve foods. I appreciate the time and effort spent in evaluating the documents which included the questionnaire and cover letter, information notebook, and self-inspection form. Many excellent comments were generated and I was able to use them to make improvements.

I incorporated suggestions shared during our last follow-up phone call into the most current draft of the documents. This draft is now being used for the pilot study. The foodservice units of two public schools, one university residence hall (contract), one hospital, and two commercial restaurants comprise the pilot study group. They are within a 55 mile radius so that I can make on-site visits to see how the documents are used.

Thank you again for your expertise and wonderful contributions to the study!

Sincerely,

Vicki Look

APPENDIX C

Summary of Evaluation by Expert Panel Members

**Questionnaire COVER LETTER Evaluation:**

Please circle or check the YES/NO for each question. Space is provided for comments.

- |    |   |            |           |
|----|---|------------|-----------|
| 1. | Does the letter create interest in the subject and motivate participants to complete the questionnaire? | YES<br>(3) | NO<br>(2) |
|----|---|------------|-----------|

comments:

*Why is this important to me?*

*What is in it for them?*

*How many incidences of tampering have been reported?*

- |    |   |            |           |
|----|---|------------|-----------|
| 2. | Is enough information provided to introduce the study and indicate usefulness of the study? | YES<br>(4) | NO<br>(1) |
|----|---|------------|-----------|

comments:

*Introduced, but usefulness is not clear.*

*What is purpose of survey?*

- |    |   |            |    |
|----|---|------------|----|
| 3. | Is the information written without biasing the participant to food tampering? | YES<br>(5) | NO |
|----|---|------------|----|

comments:

- |    |   |  |  |
|----|---|--|--|
| 4. | Changes you would suggest in content or format. |  |  |
|----|---|--|--|

comments:

*OK*

*Time frame in which you expect the questionnaire.*

Other comments:

*Could you cite an example?*

*Cover of questionnaire is more convincing than cover letter.*

*Add how food could be accidentally contaminated.*

## QUESTIONNAIRE Evaluation:

I am interested in your evaluation of the general impression given to the reader by the questionnaire, as well as the construction of questions. Please evaluate the instrument with that criteria in mind.

1. Do each of the questions seem to measure what is intended to measure? YES NO (NC)  
(4) (1) (1)

comments:

*Questions 2,4 have even number of responses while questions 1,3,5 have odd number. Would it be better to have odd number for all questions on page 3?*

2. Are all of the words understandable, or clear definitions provided? YES NO (NC)  
(3) (1) (1)

comments:

(If NO, please list)

*Redefine food tampering at top of questionnaire; participant wouldn't have to go back to letter.  
Question 1: responses mean little, what is "a lot"?  
Question 4: what is the difference between "somewhat" and "not too"? (refer to comment in question 1 above)*

3. Do the close-ended questions have one answer which seems to apply to each participant? Any groups or classifications missing? YES NO (NC)  
(2) (1) (2)

comments:

*Refer to comment in question 1 above.  
Question 13: is contracted foodservice in a hospital a 1 or 2?*

4. Is a positive impression given by the questionnaire which would encourage participants to respond? YES NO  
(5) (1) (1)

comments:

5. Are there any parts of the questionnaire which you feel are biased? YES NO (NC)  
(1) (3) (1)

comments:

(If YES, please list)

*Refer to question 1.*

- 245
6. Are the questions clearly written and easy to understand? YES NO  
(5)
- comments:  
(If NO, please list)
- Question 3: add "Do not know".*
7. Is the format clear and easy to follow? YES NO  
comments: (5)
8. Do questions contain ambiguous wording? YES NO  
comments: (5)  
(If YES, please list)
- Question 6b: should "each" be "any"?*
9. Would participants give consistent responses to questions if provided another similar questionnaire? Is the questionnaire reliable? YES NO  
(5)
- comments:
10. Please estimate the time you think participants would require to complete the questionnaire.  
Estimated time: \_\_\_\_\_ (10, 15, 20, 20, 30 minutes)
- Is this a reasonable amount of time? YES NO  
comments: (5)

Other comments:

*Question 13: suggest rewording.  
Question 17: how do you define "meals"?  
Most managers don't know how foods are contaminated.*

Note: Questions number 1 through 5 adapted from:  
Dillman, D.: Mail and telephone surveys. John Wiley and Sons, New York. 1978.

Please note that sections I through III are written at the high school level. The Dale-Chall readability test rated these sections at the eleventh to twelfth grade level. This level was chosen because participants have different educational backgrounds.

- |    |  |            |           |
|----|--|------------|-----------|
| 1. | Is the format clear?<br><u>comments:</u> | YES<br>(4) | NO<br>(1) |
|----|--|------------|-----------|

*When the answers to an activity are given there should be some direction, ie, "Questions 1,2 are answered on page 15".*

- |    |   |            |           |             |
|----|---|------------|-----------|-------------|
| 2. | The notebook has been tested at a reading level of high school, eleventh to twelfth grade for sections I-III. Does it seem clear to read?<br><u>comments:</u> | YES<br>(4) | NO<br>(1) | (NC)<br>(1) |
|----|---|------------|-----------|-------------|

*Very much so.*

*On the most part.*

*Editorial notes: page 21, first paragraph; page 26, second sentence; page 3, personification; page 22, indentation.*

- |    |   |     |           |
|----|---|-----|-----------|
| 3. | Are there any confusing terms?<br><u>comments:</u><br>(If YES, please identify) | YES | NO<br>(5) |
|----|---|-----|-----------|

- |    |   |            |           |
|----|---|------------|-----------|
| 4. | Does the notebook give the reader information about food tampering without biasing?<br><u>comments:</u> | YES<br>(5) | NO<br>(1) |
|----|---|------------|-----------|

- |    |  |            |           |
|----|--|------------|-----------|
| 5. | Are the activities meaningful? Do they contribute to the reader's understanding of food tampering?<br><u>comments:</u> | YES<br>(4) | NO<br>(1) |
|----|--|------------|-----------|

*Summary question 1 needs to be rewritten.*



6. Please estimate the length of time participants would need to complete the notebook.

Estimated time: \_\_\_\_\_ (1 hour, 1 to 1 1/2 hours, 1 1/2 hours, 2 to 4 hours, 8 hours if did all facility activities)

Is this a reasonable amount of time?	YES	NO	(NC)
(If NO, what changes would you make)	(4)		(1)

Other comments:

*Gives food information and usually clear (it might just be my interpretation). Good Work.*

## FACILITY INSPECTION FORM Evaluation:

1. Is the format easy to follow? YES NO  
comments: (5)
2. Do the questions direct the participant to an accurate evaluation of foodservice, regarding food hazard risk, (through clearly identifiable concepts or situations to observe)? YES NO (NC)  
(4) (1)  
comments:  
*Do they know what to look for?  
With limitations. In Oregon lettuce was contaminated  
and lettuce does not need much preparation.*
3. Do you feel that a foodservice manager could assess food tampering hazards by conducting a facility inspection utilizing the inspection form? YES NO  
(5)
4. Could the form be used by supervisory individuals in the foodservice, other than managers, and get equivalent results? YES NO (NC)  
(3) (1) (1)  
comments:  
*Depends on the experience of the supervisor.*
5. Please estimate the length of time participants would need to complete the inspection.  
Estimated time: \_\_\_\_\_ (10 minutes, 20 minutes, 20 minutes, 1 hour, 1 to 3 hours depending on the size of the facility)
- Is this time acceptable or realistic for a foodservice manager? YES NO (NC)  
(4) (1)  
comments:  
(If NO, what changes would you make)
- May not be from his point of view that time is money.*

Other comments:

*Good questionnaire.*

*Page 5: ratings need better names.*

*Page 6: typographical error in question 1.*

*What do they look for to be considered tampering? Do they have any idea?*

APPENDIX D

Cover Letter to Pilot Study Group;  
Pilot Study Members

(OSU Letterhead)  
(Cover Letter Accompanying Instruments)

(Name of Pilot Study Participant)  
(Organization)  
(Address)  
(City, State Zip code)

January 27, 1992

Dear (Pilot Study Participant):

Thank you for your willingness to participate in the pilot study for my research project. This research project will provide information about possible food tampering hazards associated with self-serve foods. The effect of the information notebook and foodservice inspection I have developed for managers will also be studied. The research subjects are located across the United States. Initially, 1000 foodservice managers will be contacted.

The research documents have been developed and reviewed. The next step is to test them in foodservice facilities to see how they work. Your function as a pilot study participant is very important, and I very much appreciate your contribution.

There are several documents included with this letter. Please read them in order so that testing will be most complete.

1. The first set includes a cover letter and questionnaire titled "Food Tampering in Restaurants: Are you at Risk". Please answer the questionnaire first.
2. The questionnaire is followed by a notebook, titled "Self-serve Food Protection", that discusses food tampering hazards and methods of prevention. Please read the notebook next.

3. The last item is a self-inspection titled "Food Tampering Hazard Inspection Form". It is used to evaluate your foodservice and rate possible food tampering hazards. I have included a piece of carbon paper so that you can save a copy of your inspection. I hope this won't be too inconvenient. The forms used for the national mailing will be printed so that "no carbon is required". Please complete the self-inspection last.

I am very interested to find out if you have any questions on any of the materials. Please write comments on the documents, if you wish. I would like to meet with you the first week in February to pick up the questionnaire and self-inspection. I'd also like to spend a few minutes and look at the self-serve part of your foodservice.

Please, if you have questions call me at 737-0961 (office) or 926-1680 (home).

Thank You!

Vicki Look

## (Pilot study participants)

<u>Name</u>	<u>Facility type</u>
Heidi Dupuis Assistant Foodservice Manager Eugene Public Schools 200 W Monroe Eugene, OR 757-6841	Non-commercial (non-contract)
John Mann Manager Myrl's Chuck Wagon 2125 Pacific Blvd. SW Albany, OR 926-6177 (work) 928-9035 (home)	Commercial (non-contract)
Bob Bernhard Manager The College Inn 155 NW King's Blvd Corvallis, OR 752-7127	Commercial (contract in university residence hall)
Howard Traver Foodservice Director Sacred Heart General Hospital 1255 Hilyard (PO Box 10905) Eugene, OR 97440 686-7055	Non-commercial (non-contract)
Robert Lippert Director or Nutritional Services Salem Memorial Hospital 665 Winter SE Salem. OR 97301 370-5578	Non-commercial (non-contract)

APPENDIX E

Cover Letter, Postcard, Follow-up Correspondence,  
and Questionnaire to Foodservice Managers, Phase 1



March 1, 1992

Dear Foodservice Manager:

As a foodservice manager, you are concerned about food safety and protecting your customers. *Food tampering* is a food safety issue that can put your foodservice and customers at risk. Most *food tampering* is the intentional contamination of foods to cause illness or injury to consumers. People have become ill by eating foods which were contaminated by *food tampering*.

No one really knows what managers in the foodservice industry understand about *food tampering* or how widespread it may be. We are conducting a nationwide study to find out how managers deal with the concern of *food tampering*. We plan to develop food tampering prevention methods you can use to help protect your foodservice and the health of your customers.

Please complete and mail the questionnaire. Your opinion on this food safety issue is important. Your name was randomly selected for this study. It is important that each questionnaire be filled out and returned in the postage-paid envelope so that the thinking of managers in the foodservice industry is truly represented.

Please return the questionnaire without delay. When you return the questionnaire postmarked by March 15, 1992, your name will be entered in a drawing for a \$100 cash prize. Just fill out the enclosed entry form and place in the return envelope with your questionnaire.

All responses are confidential and results will be recorded for the group, not for an individual or company. The return envelope is stamped with an identification number. This number is used to check off your name when you return the questionnaire. Numbered envelopes and questionnaires will be separated when returned. Responses will not be linked to your name or corporation.

We would be happy to answer questions about this study. Please write or call. The telephone number is (503)-737-0961.

Thank you for your assistance and participation.

Sincerely,

Victoria Look, MS, RS, RD  
Project Director

Ann Messersmith, PhD, RD  
Assistant Head, Nutrition  
and Food Management Dept.

(Postcard)

Spring 1992

Last week a questionnaire seeking your opinion about **FOOD TAMPERING** in restaurants and other foodservice facilities was mailed to you. If you have already completed and returned the questionnaire to us, please accept our thanks. If you have not, please do so today. Because the questionnaire has been sent to only a small, but representative sample of professionals, it is extremely important that your answers be included in the study if the results are to accurately represent the opinions of all foodservice and related professionals. If the questionnaire got misplaced, please call me at 503-737-0961 and another one will be mailed.

Sincerely,

Victoria Look, Project Director  
Nutrition and Food Management, Oregon State  
University  
Corvallis, Oregon 97331-5110

(OSU Letterhead)

March 22, 1992

Dear Foodservice Manager:

About three weeks ago I wrote to you seeking your opinion about food tampering in foodservice facilities. We are concerned about safety because self-serve foods may be deliberately contaminated. As of today we have not yet received your completed questionnaire.

This study is designed to learn about your responses to the food tampering issue of food safety as representative of the foodservice industry. The purpose is to develop a quick and easy method for you use to monitor your operation thus helping to protect your customers and your business from unsafe foods.

I am writing to you again because of the significance each questionnaire has to the usefulness of this study. In order for the results of the study to be truly representative of the opinions of the foodservice industry and related industry professionals, it is essential that each person return his or her questionnaire.

In the event that your questionnaire has been misplaced, a replacement is enclosed.

Your cooperation is greatly appreciated.

Sincerely,

Victoria Look, M.S., R.S., R.D.  
Project Director  
Department of Nutrition and Food Management  
Oregon State University

(OSU Letterhead)

***Please help! Please help! Please help! Please help!  
Please help!***

April 13, 1992

Dear Foodservice Manager:

I am writing to you about the study of *food tampering* in restaurants and other food facilities across the United States. We have not yet received your completed questionnaire.

The large number of questionnaires returned is very encouraging. But, whether we will be able to describe accurately how food professionals feel about the important issue of consumer safety related to *food tampering* and *self-serve foods* depends upon you and others who have not yet responded. This is because our experience suggests that those of you who have not yet sent in your questionnaires may have quite different opinions than those who have.

This is the first large study on this subject that has ever been done. Therefore, the results are of particular importance to the many individuals and corporations concerned with meeting the needs of the consumers. The usefulness of our results depends on how accurately we are able to describe how the industry is responding to the issue of intentional contamination of food in foodservice organizations.

It is for these reasons that I am writing to you again. In case our other correspondence did not reach you, a replacement questionnaire is enclosed. May I urge you to complete and return it as quickly as possible.

Your part in the success of this study will be appreciated greatly.

Sincerely,

Victoria Look, M.S., R.S., R.D.  
Project Director  
Department of Nutrition and Food Management  
Oregon State University

***Thank-you! Thank-you! Thank-you! Thank-you! Thank-you!***

## FOOD TAMPERING IN RESTAURANTS: ARE YOU AT RISK?



This 1992 survey is a *nationwide* effort to learn what foodservice managers think about *food tampering*, a unique kind of food safety concern. If you want to comment on any of the questions, please use the margins or a separate sheet of paper. Your comments are important and welcomed!

Return this questionnaire to:  
Victoria E. Look  
Dr. Ann M. Messersmith  
Nutrition and Food Management Department  
Milam 14  
Oregon State University  
Corvallis, Oregon 97331-5110  
phone 503-737-0961

## FOOD TAMPERING SURVEY

260

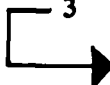
***Food tampering*** is the intentional contamination of foods to cause illness or injury to consumers. Some ***food tampering*** may be accidental and done without a harmful plan.

1. During the last 12 months, how much have you read or heard of the issues surrounding ***food tampering*** happening in foodservice facilities? (Circle one number)
  - 1 A LOT
  - 2 SOME
  - 3 NOTHING
  
2. In your opinion, what is the risk of food tampering occurring in any type of foodservice facility (such as restaurants, schools, clubs, hospitals) throughout the United States? (Circle one number)
  - 1 HIGH RISK
  - 2 LOW RISK
  - 3 NO RISK
  
3. To your knowledge, has food tampering in foodservices occurred in the city or town where your foodservice is located? (Circle one number)
  - 1 YES, FOR CERTAIN
  - 2 YES, SUSPECTED
  - 3 NO
  - 4 DO NOT KNOW
  
4. Generally, how concerned are you about the possibility of food tampering in *your* facility? (Circle one number)
  - 1 VERY CONCERNED
  - 2 SOMEWHAT CONCERNED
  - 3 NOT AT ALL CONCERNED
  
5. Do you, or does your company, use the Sanitary Assessment of Foodservice Environment (SAFE) or Hazard Analysis Critical Control Point (HACCP) program? (Circle one number)
  - 1 YES
  - 2 NO
  - 3 DO NOT KNOW

(PLEASE TURN THE PAGE)

6. Do you, or does your company, use in-house inspection programs? (Circle one number)

- 1 DON'T KNOW (Skip to question 7)  
 2 NO (Skip to question 7)  
 3 YES, USE



6a. Please indicate whether or not each of the following in-house inspections are used. (Circle one number for each)

	<u>YES</u>	<u>NO</u>	<u>DON'T KNOW</u>
a. Sanitation	1	2	3
b. Food safety	1	2	3
c. Accident prevention	1	2	3
d. Equipment and/or facility maintenance	1	2	3
e. Other (please specify)	1	2	3
( _____ )			

6b. Indicate whether or not you obtained the in-house inspection program from each of the following organizations. (Circle one number for each)

	<u>YES</u>	<u>NO</u>	<u>DON'T KNOW</u>
a. Developed by my company	1	2	3
b. National Restaurant Assoc	1	2	3
c. Health department	1	2	3
d. Community college	1	2	3
e. Other (please specify)	1	2	3
( _____ )			

7. Do you think that food safety programs which include in-house inspections help reduce the risk of food tampering? (Circle one number)

- 1 YES, REDUCES RISK  
 2 NO  
 3 DO NOT KNOW

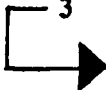
8. Some foodservice managers believe that self-serve foods may be at risk for food tampering. In your opinion, would in-house inspection and safety programs aimed at protecting self-serve foods help reduce the risk of food tampering? (Circle one number)

- 1 YES, WOULD REDUCE RISK  
 2 NO

(PLEASE GO ON TO THE NEXT PAGE)

9. Does your foodservice offer self-serve foods? (Circle one number)

- 1 NO (Skip to question 10)
- 2 NO, BUT PLAN TO ADD SELF-SERVE FOODS (Skip to question 10)
- 3 YES

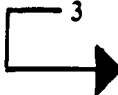


9a. Please indicate whether or not you offer the following types of self-serve. (Circle one number for each)

	YES	NO
a. Cafeteria style	1	2
b. Salad bar	1	2
c. Pasta bar	1	2
d. Dessert bar	1	2
e. Hot/cold buffet	1	2
f. Bowls of bar snacks	1	2
g. Beverages only	1	2
h. Other (please specify)	1	2
( _____ )		

9b. If your foodservice has the potential for risk of food tampering associated with self-serve foods, what action would you take? (Circle one number)

- 1 THERE IS NO RISK
- 2 DO NOTHING AND ACCEPT THE RISK
- 3 MAKE CHANGES TO REDUCE THE RISK



9c. Please identify whether or not you might make the following changes. (Circle one number for each)

	YES	NO
a. Implement in-house inspections for food safety	1	2
b. Discontinue use of self-serve foods	1	2
c. Increase labor for supervision of the self-serve food area	1	2
d. Buy or modify self-serve equipment	1	2
e. Redesign self-serve area by changing floor plan	1	2
f. Other (please specify)	1	2
( _____ )		

(PLEASE TURN THE PAGE)



10. Below are some concerns associated with self-serve foods. Please indicate whether or not each would be a concern for you as a foodservice manager. (Circle one number for each)

	YES	NO
a. Controlling food cost	1	2
b. Food safety concerns	1	2
c. Space limitations	1	2
d. Controlling labor cost	1	2
e. Food quality control	1	2
f. Other (please specify)	1	2

( \_\_\_\_\_ )

11. If you were constructing or remodeling the self-serve area of a foodservice do you believe a review of the floor plans (blueprints) would be useful to help reduce food tampering risk? (Circle one number)

- 1 YES, WOULD BE USEFUL  
 2 PERHAPS SOME LIMITED USEFULNESS  
 3 NO, NOT VERY USEFUL

12. To your knowledge, has food tampering occurred in *your* foodservice facility? (Circle one number)

- 1 YES, FOR CERTAIN  
 2 YES, SUSPECTED  
 3 NO  
 4 DO NOT KNOW

*The next few questions are about your foodservice operation.*

13. Is your foodservice a contract or non-contract operation? (Circle one number)

- 1 CONTRACT  
 2 NON-CONTRACT

14. Which of the following *best* describes your foodservice? (Circle one number)

- 1 RESTAURANT  
 2 SCHOOL  
 3 HEALTH CARE  
 4 INDUSTRY  
 5 GOVERNMENT, OTHER THAN SCHOOL  
 6 TRANSPORTATION  
 7 OTHER (PLEASE SPECIFY) ( \_\_\_\_\_ )

(PLEASE GO ON TO THE NEXT PAGE)

15. Do you consider your foodservice facility to be located in a rural or urban area?  
(Circle one number)
- 1 RURAL
  - 2 URBAN
16. Please estimate the population of the city/town where your foodservice is located.  
(Circle one number)
- 1 LESS THAN 10,000
  - 2 10,001 TO 50,000
  - 3 50,001 TO 100,000
  - 4 100,001 TO 500,000
  - 5 LARGER THAN 500,000
17. Please estimate the number of *customers/covers* you serve *each day*.  
(Circle one number)
- 1 100 OR LESS
  - 2 101 TO 500
  - 3 501 TO 1000
  - 4 OVER 1001
18. Where did you receive your *food-related* education? (Circle one number)
- 1 HIGH SCHOOL
  - 2 COMMUNITY COLLEGE / JUNIOR COLLEGE
  - 3 CULINARY ARTS COLLEGE
  - 4 COLLEGE / UNIVERSITY
  - 5 ON-THE-JOB
19. What is the highest educational degree you have received? (Circle one number)
- 1 HIGH SCHOOL
  - 2 ASSOCIATE
  - 3 CERTIFICATE
  - 4 BACHELOR'S OR HIGHER
  - 5 OTHER (PLEASE SPECIFY) (\_\_\_\_\_)
- 19a. List the major area of study for your degree
- \_\_\_\_\_
20. In what state is this foodservice facility located? \_\_\_\_\_
21. What is your title? \_\_\_\_\_

(PLEASE TURN THE PAGE)

Are there any additional comments that you would like to make regarding *food tampering*, *self-serve foods*, *food safety*, or *methods* to protect foods for customers? Please use this page for comments.

Your contributions to this effort are very important and greatly appreciated.

**THANK YOU FOR PARTICIPATING IN THE SURVEY!**

## APPENDIX F

Cover letter, Postcard, Follow-up Correspondence,  
and Treatment Tool, Post-test  
to Experimental and Control Groups, Phase 2

(OSU Letterhead)

May 21, 1992

Dear Foodservice Manager:

Thank you for replying to the questionnaire, "*Food Tampering: Is Your Restaurant at Risk?*" Your opinion on this food safety issue is highly valued. The response of professionals in your field is very encouraging for further study.

I am happy to announce that the winner of the \$100 cash prize for returning the questionnaire was Debra P. of Slippery Rock, PA. Many thanks to each of you for responding.

I am continuing this study to help foodservice professionals learn more about *food tampering* and possible ways of protecting their customers and operation. Your help in evaluating the effectiveness of this study is greatly appreciated. A notebook titled, "Self-serve Food Protection: Food Tampering Protection for Self-serve Foods" is enclosed for your reference. The notebook contains information and activities which show you how to apply food tampering-related safety principles to your foodservice. The notebook was designed to require minimal time, as foodservice professionals are busy people. Please read the notebook and complete the activities. This notebook is your to keep.

Also, enclosed you will find the form, "Food Tampering Hazard Inspection Form". This is a self-inspection form which you use to judge the possibility of food tampering in your foodservice facility. Please complete the form after reading the notebook and return in the postage-paid envelope. This form also was designed to take the least amount of your time possible. An extra form is included for your reference.

All responses are confidential and results will be recorded for the group, not for an individual or company. Forms are numbered so that I may check off your name when it is returned.

I look forward to receiving your response. I would be happy to answer questions about this study. Please call me at (503) 737-0961 or (503) 926-1680.

Thank you for your assistance and participation. I hope the notebook and self-inspection form are helpful to you and your organization.

Sincerely,

Victoria Look, M.S., R.S., R.D.  
Project Director

May 21, 1992

Dear Foodservice Manager:

Thank you for replying to the questionnaire, "*Food Tampering: Is Your Restaurant at Risk?*" Your opinion on this food safety issue is highly valued. The response of professionals in your field is very encouraging for further study.

I am happy to announce that the winner of the \$100 cash prize for returning the questionnaire was Debra P. of Slippery Rock, PA. Many thanks to each of you for responding.

I am continuing this study to help foodservice professionals learn more about *food tampering* and possible ways of protecting their customers and operation. Your help in evaluating the effectiveness of this study is greatly appreciated.

Enclosed you will find the form, "Food Tampering Hazard Inspection Form". This is a self-inspection form which you use to judge the possibility of food tampering in your foodservice facility. Please complete the form by making a brief inspection of your facility and answering a few questions. Please return the copy after completion in the postage-paid envelope. An extra form is enclosed for you to keep for future reference. This self-inspection form was designed to require the least amount of your time possible, as foodservice professionals are very busy.

All responses are confidential and results will be recorded for the group, not for an individual or company. Forms are numbered so that I may check off your name when it is returned.

I look forward to receiving your response. I would be happy to answer questions about this study. Please call me at (503) 737-0961 or (503) 926-1680.

Thank you for your assistance and participation. I hope the self-inspection form is helpful to you and your organization.

Sincerely,

Victoria Look, M.S., R.S., R.D.  
Project Director

(Postcard)

Summer 1992

Two weeks ago a *FOOD TAMPERING HAZARD INSPECTION FORM* was mailed to you. This is a self-inspection form which you use to judge the possibility of *FOOD TAMPERING* in your foodservice facility. If you have already completed and returned the form, please accept my **THANKS**. If you have not, please do so today. Because the form has been sent to only a small, but representative sample of professionals, it is extremely important that your answers be included in the study if the results are to accurately represent foodservice and related professionals. If the form got misplaced, please call me at 503-737-0961 and another one will be mailed.

Sincerely,

Victoria Look, Project Director  
Nutrition and Food Management, Oregon State University  
Corvallis, Oregon 97331-5110

(OSU Letterhead)  
(Follow-up Mailing to Experimental and Control Groups)

June 25, 1992

Dear Foodservice Manager:

About four weeks ago I wrote to you seeking your response to *food tampering* in foodservice facilities. We are concerned about food and customer safety because self-serve foods may be deliberately contaminated. As of today we have not yet received your completed **FOOD TAMPERING HAZARD INSPECTION FORM**.

This study is designed to learn about your responses to the *food tampering* issue of *food safety* as representative of the foodservice industry. The purpose of the study is to develop a quick and easy method for you use to monitor your operation thus helping to protect your customers and business from unsafe foods. The **FOOD TAMPERING HAZARD INSPECTION FORM** is a method which has been developed.

I am writing to you again because of the significance each **FORM** has to the usefulness of this study. In order for the results of the study to be truly representative of the opinions of the foodservice industry and related industry professionals, it is essential that each person return his or her completed **FOOD TAMPERING HAZARD INSPECTION FORM**.

In the event that your **FORM** has been misplaced, a replacement is enclosed.

Your cooperation is greatly appreciated.

Sincerely,

Victoria Look, M.S., R.S., R.D.  
Project Director  
Department of Nutrition and Food Management  
Oregon State University



(OSU Letterhead)

July 24, 1992

Dear Foodservice Manager:

THANK YOU for your interest and prior response regarding the study of *food tampering* in restaurants and other food facilities across the United States. Several weeks ago I sent you the last *form* developed for the study. An extra form was included for your records.

I have not yet received your completed *FOOD TAMPERING HAZARD INSPECTION FORM*. Fire destroyed Oregon State University's mailing services building on July 13, 1992. If you mailed your *form* several days before July 13, and are receiving this reminder letter, your response may have been destroyed. I heard from several of you who returned *forms* without code numbers. Sorry, I don't know who you are, so you are also receiving this reminder letter.

The number of *food tampering hazard inspection forms* returned is encouraging. Your response is critical to the outcome of this study. Whether I will be able to describe accurately how food professionals feel about the important issue of consumer safety related to *food tampering* and *self-serve foods* depends upon you and others who have not yet responded. This is because our experience suggests that those of you who have not yet sent in your *food tampering hazard inspection forms* may have quite different opinions than those who have.

This is the first large study on this subject that has ever been done. Therefore, the results are of particular importance to the many individuals and corporations concerned with meeting the needs of the consumers. The usefulness of our results depends on how accurately we are able to describe how the industry is responding to the issue of intentional contamination of food in foodservice organizations.

It is for these reasons that I am writing to you again. In case our other correspondence did not reach you, or your response was destroyed by fire, a replacement *food tampering hazard inspection form* is enclosed. May I urge you to complete and return it as quickly as possible so that your opinion can be included.

I greatly appreciate your part in the success of this study.

Sincerely,

Victoria Look, M.S., R.S., R.D.  
Project Director  
Department of Nutrition and Food Management  
Oregon State University

(Workbook)

**SELF-SERVE FOOD PROTECTION****Food Tampering Protection  
for  
Self-Serve Foods***developed by:*

Victoria E. Look, M.S., R.S., R.D.  
Department of Nutrition and Food Management  
Oregon State University

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## I. INTRODUCTION

SELF-SERVE FOOD PROTECTION is a food safety program for the foodservice industry. Managers of foodservices who use the program help protect self-serve foods from contamination. Contaminated foods may be unsafe to eat. A type of food contamination is *food tampering*. The goal of using SELF-SERVE FOOD PROTECTION is to protect foods from *food tampering*. This helps protect your customer's health and your business.

### OBJECTIVES

1. To show the foodservice manager *food tampering* hazards of customer self-serve foods.
2. To explain steps to control *food tampering* in self-serve areas.
3. To describe ways to measure the chance of *food tampering*.

### GENERAL INFORMATION

*Food Tampering* is the intentional contamination of foods to threaten or cause illness or injury to consumers. Foods may also be accidentally contaminated. Contaminated foods eaten by customers may make them ill.

The *food tampering* problem costs:

- \* human suffering
- \* dollar loss from medical bills and lawsuits
- \* loss of business from poor public relations

The problem is complicated. No one really knows how widespread *food tampering* in restaurants may be. Probably *food tampering* seldom happens. But *food tampering* has occurred in the United States making many people ill.

Example: *Food tampering* event in Oregon restaurants in which over 750 customers and employees became ill. Self-serve foods were made unsafe by tampering; *salmonellosis* caused the illness.

**SELF-SERVE FOOD PROTECTION shows you how to apply safety principles to your foodservice. Your knowledge of food tampering gives you the power to help control food tampering.**

Who tampers? Almost anyone can tamper with foods you serve.

*Food tamperers* may be anyone with access to foods:

- \* customers
- \* suppliers or service persons
- \* current or former employees

They may be:

- \* disturbed individuals
- \* spiteful, trying to "get even" when fired
- \* political, social, or religious extremists

What foods are at risk? *Food tampering* can happen to almost any food being served. Self-serve foods are in danger because they are open to customers. Having self-service in your foodservice usually means that you give up some control on safety.

What can YOU do, as a manager?

*You need to understand and control food tampering hazards for self-serve foods. It becomes a part of your food safety program. It protects customers from illness or injury. It protects the security of your business.*

What do YOU need to know?

- \* Managers need to know how to use SELF-SERVE FOOD PROTECTION and how it helps your foodservice.
- \* Costs for a foodservice can be high when customers become ill.
- \* SELF-SERVE FOOD PROTECTION program helps you control the safety of self-serve foods.
- \* Be aware of food contamination agents. Agents include biological (bacteria, virus), chemical (food additives, chemicals), and physical (metal, glass pieces) contaminants.
- \* Finally, you need the desire to begin.

How to use this SELF-SERVE FOOD PROTECTION notebook:

- \* Read Section I: Information (pages 2-5) and Section II: Basic Steps (pages 6-10) to learn about *food tampering* hazards.
- \* Then see how you can apply the Basic Steps to your foodservice. Section III: Using the Basic Steps has Examples and Activities to guide you (pages 11-24).
- \* Complete the Activities to see how SELF-SERVE FOOD PROTECTION can help your foodservice.

When you finish this notebook, you will be able to:

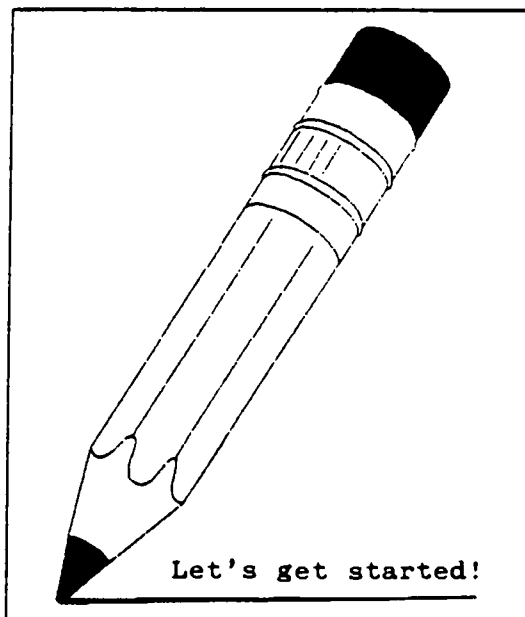
- \* Rate the *food tampering* hazards of several foodservice floor plans.
- \* Identify Control Check Points to help control *food tampering* in your foodservice.

## II. THE BASIC STEPS

SELF-SERVE FOOD PROTECTION is:

- \* a 3-step program
- \* for self-serve foods in the serving area
- \* used to identify and monitor *food tampering* hazards
- \* built on principles of the food safety program, Hazard Analysis Critical Control Point (HACCP). See Section IV (page 26) for more information.
- \* a program that managers can use for food safety in the self-serve area

*The SELF-SERVE FOOD PROTECTION program starts where most food safety programs end; the service area for foods.*



**Step 1**  
Identify food tampering hazards

**Step 2**  
Identify Control Check Points

**Step 3**  
Use monitoring system

**Chart of Basic Steps\***  
**for SELF-SERVE FOOD PROTECTION**

\* The Basic Steps are general and can be used in your foodservice.



## STEP 1

## Identify Food Tampering Hazards

There are *food tampering* hazards in almost any foodservice. When you look closely at a foodservice, you can find conditions which may be food safety hazards. In Step 1 you identify procedures which may be *food tampering* hazards.

Identify Possible *Food Tampering* Hazards:

- \* Type of food served  
(How much is it handled?)
- \* Floor plan of self-serve area  
(Is the area easy to observe and supply with food?)
- \* Location of self-serve area in foodservice  
(Is it easy to observe and supervise?)
- \* Serving equipment  
(Does equipment protect foods?)
- \* Serving method  
(Is self-serve area attended or supervised by employee(s)?)

How do you Identify *Food Tampering* Hazards?

Look carefully at your foodservice operation. Find conditions which may contribute to *food tampering*.

- \* Start with self-serve foods
- \* Follow the food from back-up storage, to service, to customers.
- \* Find out how easy it is to observe customers, employees, and self-serve foods.
- \* Find out if people who are not your employees could have access to foods. Are they in your kitchen? Your storage area? Could they tamper with food? Could employees tamper with food?
- \* Check serving and holding equipment to see if it works correctly.

## STEP 2

## Identify Control Check Points

In Step 1 you looked at the self-serve area and foods for possible *food tampering* hazards. Step 2 now identifies Control Check Points.

Control Check Points are:

- \* places
- \* procedures
- \* where control of possible *food tampering* hazards is needed

Control Check Point examples may include:

- \* Inspect foods going to self-serve area.  
Inspect for changes in the look (such as color or arrangement), smell, or temperature<sup>1</sup> of foods. Has someone tampered with food before it is served?  
Example: food looks stirred, or texture changed.
- \* Inspect foods which are out in the self-serve area.  
Again, watch for changes in the look, smell, or temperature.

Keep in mind that a person who tampers with food may hide their actions. You may not see changes in foods.

- \* Knowing where and when food may be handled by employees or other individuals, such as:
  - \* food transported to serving area
  - \* food in back-up storage
  - \* panning or portioning before service
- \* Self-serve equipment operation and use, including:
  - \* refrigerated salad bars
  - \* warmers
  - \* beverage dispensers
- \* Observe foods and the customer's actions in the self-serve area. Watch for activities which might mean someone is tampering with food. Example: loitering in self-serve area or fooling with self-serve foods but not eating.

Note<sup>1</sup>: Intentional failure to maintain proper temperature control of foods could be a form of tampering. However, correct temperature control may reduce the chances of illness from certain kinds of bacteria introduced by a tamperer.

## STEP 3

## Use a Monitoring System

Step 2 showed methods to prevent possible *food tampering* hazards at the Control Check Points. Step 3 now shows how a Monitoring System is used to see if methods are adequate and used correctly. Monitoring is finding out if a process at a Control Check Point is correctly watched. Monitoring is not the same as inspecting. However, inspections, observations, and measurements give you information about Control Check Points and are a part of monitoring.

## Steps of Monitoring System:

- \* Inspect or Observe Control Check Points, such as procedures or places where possible *food tampering* hazards may be found.
- \* Measure Control Check Points, such as temperature.
- \* Test food as needed. (Bacteria or chemical tests are done in a laboratory, may be expensive.)
- \* Record inspections and measures. Check lists are an easy way. These are your monitoring records.
- \* Management reviews Control Check Point monitoring records to find problems or successes in the program.

## Monitoring System must be:

- \* quick and simple to use
- \* with easy record keeping

A monitoring system shows if you meet your *food tampering* safety standards. If you find a problem, a quick and simple system lets you make corrections quickly. Hopefully, before you have to throw out food or before illness or injury results. Easy record keeping will help you keep information for monitoring.

## How often you monitor depends on:

- \* the type of foodservice
- \* number of *food tampering* hazards
- \* cost of labor and tests

### III. USING THE BASIC STEPS

You now know the three Basic Steps of the SELF-SERVE FOOD PROTECTION method:

1. Identify *food tampering* hazards
2. Identify Control Check Points
3. Use a Monitoring System

Now, the Basic Steps are applied to foodservices by activities and examples (pages 12 to 23).

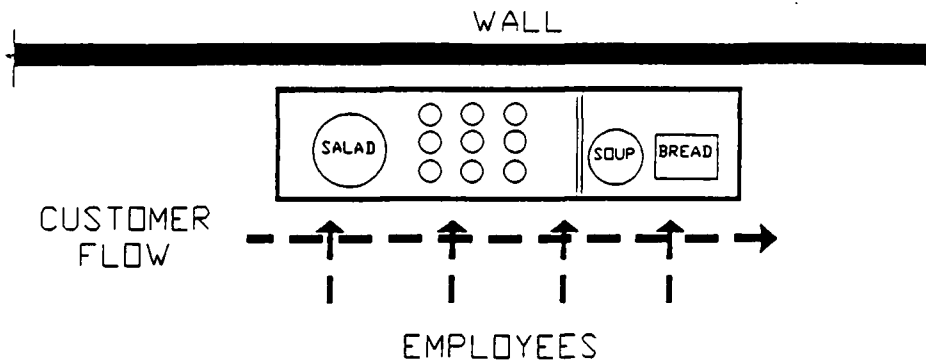
Please turn the page for your first Activity!

*Concept: Self-serve area floor plans which allow the most observation of customers, food, and employees have less food tampering hazard.*

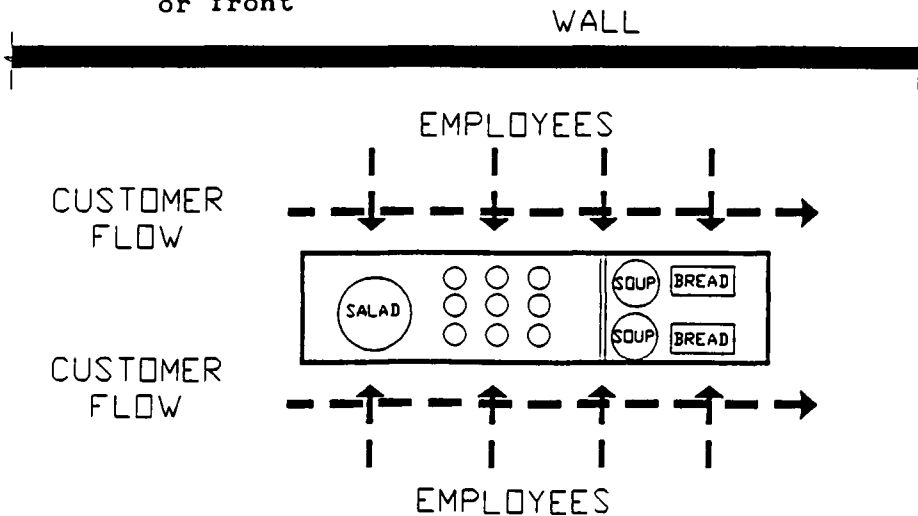
Floor Plans for self-serve areas:

Four examples of floor plans for self-serve areas are given. These floor plans are different in several ways. Some let managers easily observe employees and customer actions. Some let employees more easily service (fill and maintain) the self-serve area. Look carefully at each self-serve area floor plan. Decide which floor plan has the greatest and least hazard for food tampering. Make your decision on how easy it is to observe and service the self-serve area.

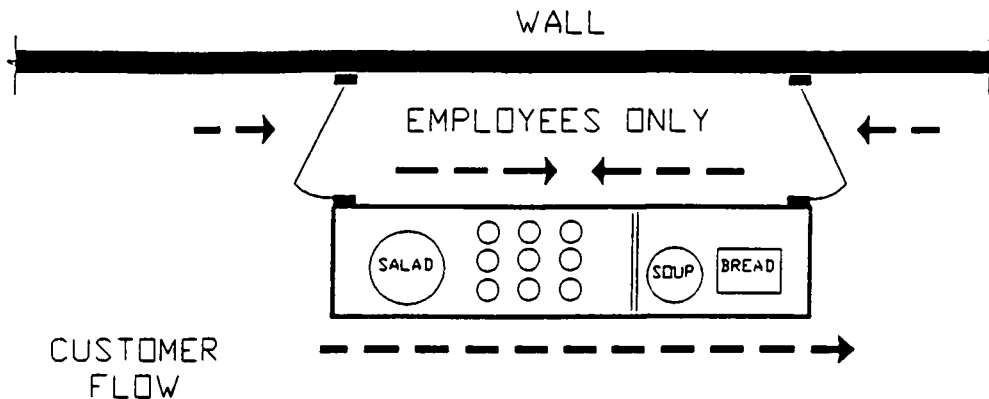
Plan 1: 1-sided customer service, employees fill from front



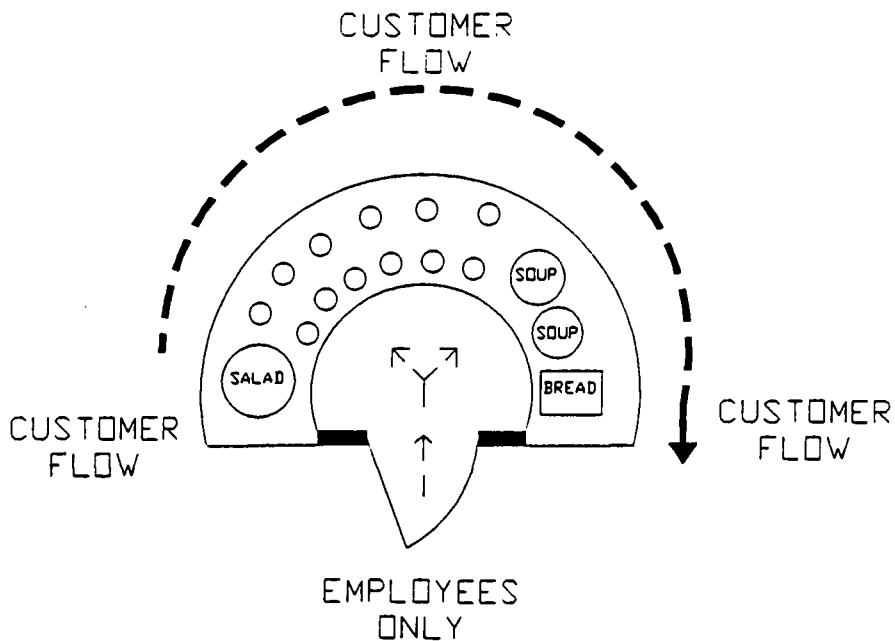
Plan 2: 2-sided customer service, employees fill from back or front



Plan 3: 1-sided customer service, employee fill from back



Plan 4: Circular, front customer service, employees fill from back



## ACTIVITY ONE Questions:

Please answer the following questions. Answers to Questions 1 and 2 are on page 15. Question 3 is about your foodservice.

## Question 1.

Based on how easy it is to observe food and customers, which floor plan examples have the least food tampering hazard; Plan 1, Plan 2, Plan 3, or Plan 4?

(Answer) \_\_\_\_\_

## Question 2.

Which floor plan has the greatest food tampering hazard; Plan 1, Plan 2, Plan 3, or Plan 4?

(Answer) \_\_\_\_\_



Check the plans you selected with the Description of Self-serve Plans on the next page.

## Question 3.

Which self-serve area floor plan, or plans, is most like your foodservice; Plan 1, Plan 2, Plan 3, or Plan 4?

(Answer) \_\_\_\_\_

*Knowing which general style of self-serve area floor plan is most like your foodservice can help you evaluate food tampering hazards. Perhaps you will get ideas for changing the floor plan of the area during remodeling or when equipment is purchased.*

## ACTIVITY ONE Answers (to Questions 1, 2)

## Description of Self-serve Example Plans 1, 2, 3, and 4.

Plan 1: (page 12) Customers and employees use the front side only. Employees fill food from the front of unit. Customer's backs are seen which makes it a problem to see how they handle food. It may be hard for management to observe and service (fill and clean) the area during busy times. Estimated food tampering hazard is greater than Plan 2, Plan 3, or Plan 4.

Plan 2: (page 12) Island-style self-serve. Customers use both sides of the self-serve unit. Employees fill food from the front or back. It may be hard to observe or service the area during busy times. Estimated of food tampering hazard is greater than Plan 3 or Plan 4.

Plan 3: (page 13) Self-serve area has customer service on front side only. The back side is for employees to fill food and maintain cleaning. Employees are behind the self-serve area. This design makes it easier to observe customers. They can be seen from both sides. Estimated food tampering hazard is less than Plan 1 or Plan 2.

Plan 4: (page 13) Curved design allows customer service on the front side. The back, or inside area, is used by employees who fill and maintain the self-serve area. This design is about the same as Plan 3. It is easy to observe customers from both sides. Estimated food tampering hazard is less than Plan 1 or Plan 2.

## Summary:

Estimated lowest food tampering hazard. . . . Plan 3 or Plan 4

Estimated intermediate food tampering hazard. . .Plan 2

Estimated highest food tampering hazard. . . . Plan 1



## ACTIVITY TWO

*Concept: The control of food tampering hazards may depend on placement of self-serve areas in foodservices. Greater control of food tampering hazards is possible if self-serve areas are placed in the main path of customers and easily observed.*

Floor plans of foodservices with self-serve area:

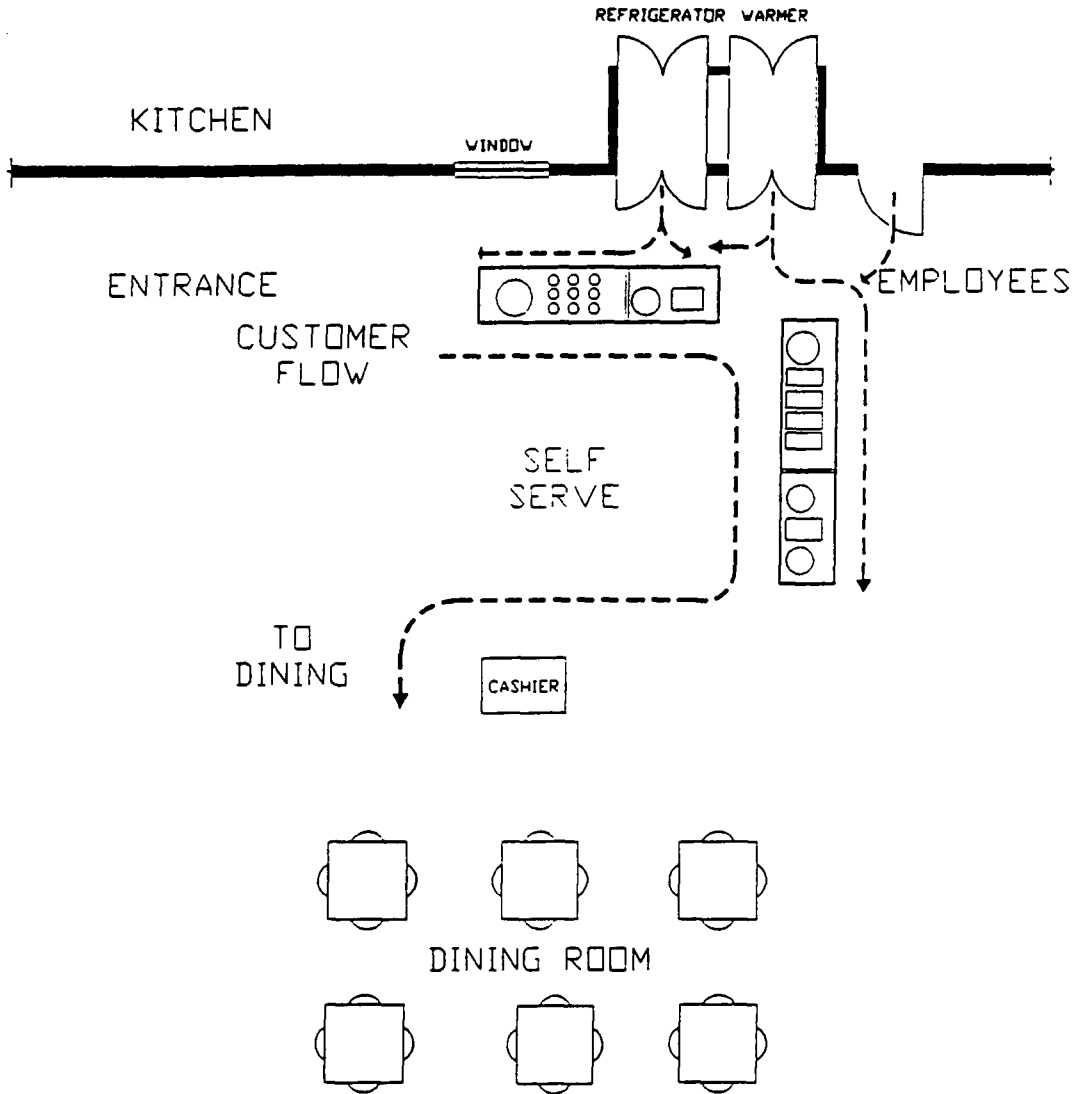
Many floor plans which include self-serve are used today. Some floor plans were designed with self-serve as a part of the foodservice. Others added self-serve after the foodservice was built. Keep in mind there are many floor plans possible. The following Guidelines are given:

Floor Plan Guidelines to Control Food Tampering Hazards:

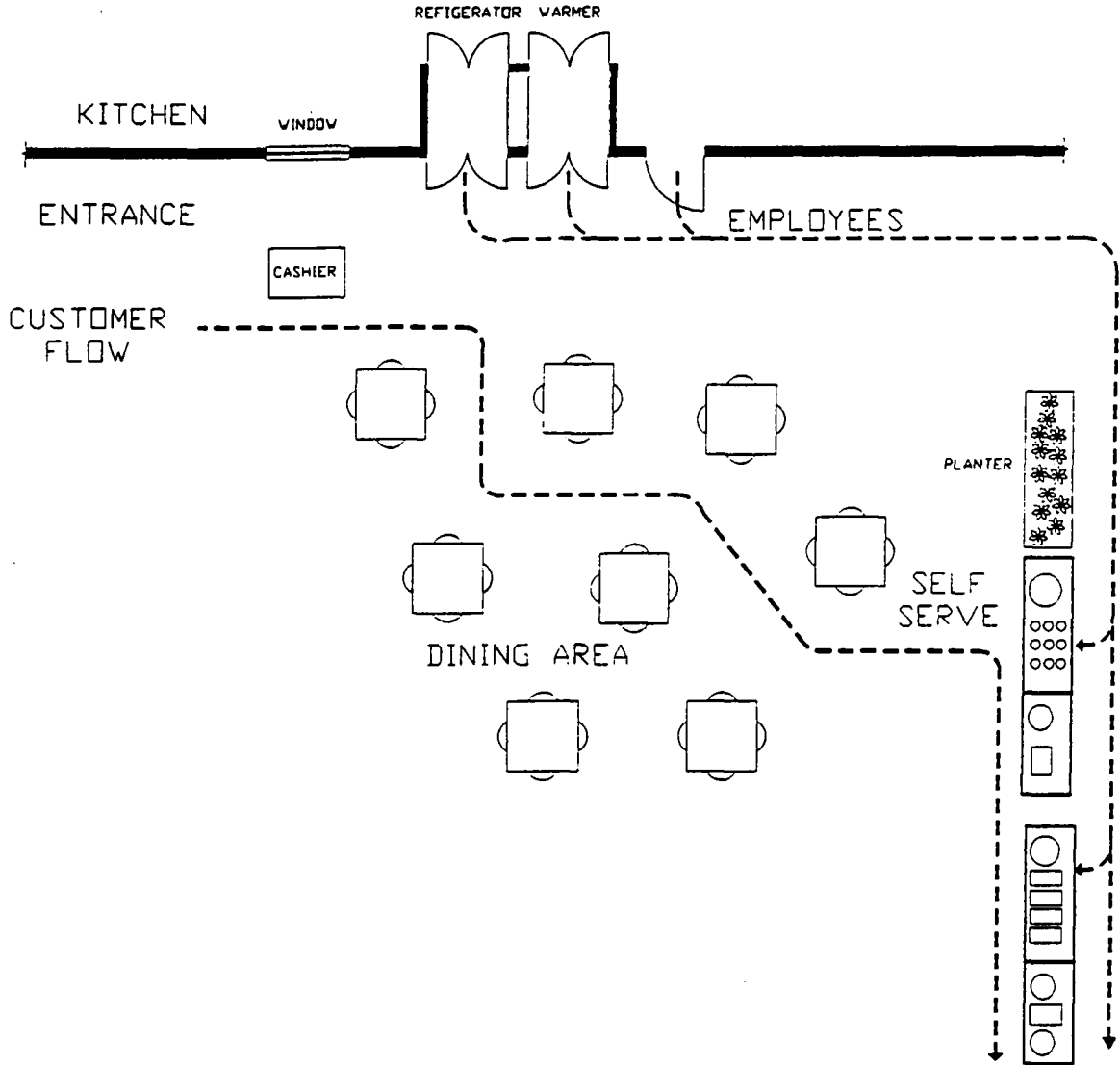
- \* Floor plans with self-serve areas in the path of customers and employees lead to quick service. Customers are less likely to loiter and their actions can be observed.
- \* Management needs a clear view of the self-serve area. Self-serve areas near the main path of customer and employee travel may be easier to watch.
- \* Put self-serve areas close to where the back-up food is stored. This shortens the distance food is moved. There is less chance for tampering.

Two examples of foodservice floor plans follow. Look closely at how the plans are different. Decide which plan has the greatest and least food tampering hazard. Make your decision on which plan would have the most direct path for customers to and from the self-serve area. Also, decide which plan would be easiest for management to observe customers and employees. Employees need to easily service the self-serve area.

Plan 5:



Plan 6:



## ACTIVITY TWO Questions:

Please answer the following questions. Answers to Questions 4 and 5 are on page 20. Questions 6, 7, 8 are about your foodservice.

## Question 4.

Which of the floor plan examples, do you believe, has the greatest food tampering hazard; Plan 5 (page 17) or Plan 6 (page 18)?

(Answer) \_\_\_\_\_

## Question 5.

Which floor plan example has the least hazard for food tampering; Plan 5 or Plan 6?

(Answer) \_\_\_\_\_



Check your floor plan selection (Plan 5 or Plan 6) with the discussion of the Floor Plan of Foodservices with Self-serve on the next page.

## Question 6.

Does the floor plan in your foodservice let you observe the customers in the self-serve area?

yes / no

## Question 7.

Does the floor plan of your foodservice let individuals (customers, employees, or others) be around self-serve foods without being noticed?

yes / no

## Question 8.

In your opinion, are there any changes you might make in the planning or remodelling of your facility to reduce the food tampering hazard?

yes / no

## ACTIVITY TWO Answers (to Questions 5,6)

## Description of Floor Plans including Self-serve:

## Plan 5: (page 17)

This plan shows a foodservice where observation of the self-serve area is good. This comes from a direct movement of customers through the foodservice. They enter, go to self-serve, and to the dining area. The self-serve area is placed close to the kitchen. Foods are close by. The window in the kitchen wall lets you watch the self-serve area. The managers' station, or cash stand, is placed so that customers and foods can be watched.

## Plan 6: (page 18)

Plan 6 shows a different arrangement of self-serve and dining areas. Movement of customers is not as direct as Plan 5. The self-serve area is harder to watch because it is away from the flow of customers and employees. The self-serve area is not as close to the kitchen as Plan 5, so back-up food storage is not as available. It is not too easy to watch customers and employees from the manager's station, or cash stand.

According to the Floor Plan Guidelines to Reduce Food Tampering Hazards (page 16), Plan 5 has the least hazard for food tampering. Plan 6 has the greatest food tampering hazard of the two example plans.

**ACTIVITY THREE**

***Concept: Charting a food item uses the 3 Basic Steps of SELF-SERVE FOOD PROTECTION. This is a way to begin your own SELF-SERVE FOOD PROTECTION program.***

**Making a Food Chart for your foodservice:****How to start:**

- \* Choose one item you offer for self-serve, such as a salad, entree, or dessert.
- \* List how the food is handled and prepared to be served.
- \* You may need to know:

Who receives the food from the supplier or kitchen?  
Who is responsible for the food?

Who keeps the food supplied to the self-serve area?  
Who checks to see if equipment is working to protect foods?

Could anyone reach the food and tamper with it? If so, where and when?

An example of a Food Chart is on the next page (page 22). Please look at it closely. The example is made to be general and no menu item is named. This is so that managers with different types of foodservices and many different self-serve menu items can use the example Food Chart. Some questions about your foodservice are listed in the example. These questions will help guide you to make a Food Chart for your foodservice. The Food Chart for you to fill out is on page 23.

Please turn the page for the Example SELF-SERVE FOOD PROTECTION Food Chart.

Example: SELF-SERVE FOOD PROTECTION Food Chart

Process	Identify Food Tampering Hazards and Control Check Points	Monitoring system
Receive foods made for self-serve.	<p><u>Source:</u>            Made in-house or Ready-made and transported from supplier, central kitchen?</p> <p>Examine packaging: holes, rips, punctures?            Check food temperature: below 45°F. or above 140°F.?            Look at appearance: any off-odors, color, or objects?</p> <p><u>Handling:</u>            Is self-serve food ever left unattended on dock, or during preparation?            Left out of warmers or refrigerators?</p>	<p>Record foods received.</p> <p>Record inspections of food conditions.</p> <p>Review policy for food handling.            Inspect to see if policy is followed.</p>
Back-up storage of self-serve foods.	<p><u>Equipment:</u>            Keeps proper holding temperatures?            Protects foods?</p> <p><u>Handling:</u>            Who can get to foods?            Can people, other than employees, access food?</p>	<p>Record inspections of equipment.</p> <p>Review policy to limit kitchen access.            Inspect to see if policy is followed.</p>
Self-serve area.	<p><u>Self-serve Equipment:</u>            Keeps proper temperature?            Protects foods? (covers, sneeze guards, serving utensils)</p> <p><u>Observation, Food Handling:</u>            Employees working at self-serve area?            Customer actions at self-serve area?</p>	<p>Record equipment inspections.</p> <p>Review policy for reporting suspect foods or behaviors.            Monitor to see if policy is followed.</p>

## ACTIVITY THREE, continued

You have looked at the Food Chart example (page 22) and have an idea of how charting works. Now you are ready to get started with your own SELF-SERVE FOOD PROTECTION program. Please fill out the Food Chart on this page. Start by picking one self-serve food you serve. Write down how the food is handled, prepared for self-serve, and served. Look back at pages 21 and 22 if you need help.

Food picked for Food Chart: \_\_\_\_\_

SELF-SERVE FOOD PROTECTION Food Chart

Process	Identify Food Tampering Hazards and Control Check Points	Monitoring System
---------	--	----------------------



**SUMMARY QUESTIONS:**

Please use the information in this notebook to answer questions 9, 10, 11. Answers and discussions for the questions are on page 25.

**Question 9.**

Describe two conditions in a foodservice which may lead to greater *food tampering* hazards for self-serve foods.

- 1.
- 2.

**Question 10.**

What are the 3 Basic Steps of the SELF-SERVE FOOD PROTECTION program?

- 1.
- 2.
- 3.

**Question 11.**

Is monitoring the same as inspecting?

Please turn the page to find Answers and Discussion to the questions.

Answers and discussion:

1. Each foodservice is different. There are many possible *food tampering* hazards in foodservices. Some examples of possible hazards include:

Design of the self-serve area makes it hard to easily observe customers.

Self-serve area is hard to service, supply with food.

Location of self-serve area within foodservice makes it hard to observe customers or employees.

Self-serve equipment does not protect foods: no covers, sneeze guards, or temperature control.

Food is transported to self-serve from a central kitchen.

2. The 3 Basic Steps are:

1. Identify *food tampering* hazards
2. Identify Control Check Points
3. Use a Monitoring System

3. No. Inspection is part of the monitoring process. Monitoring makes certain that inspections are done.

#### IV. ADDITIONAL INFORMATION

This section has information about a food protection program used to develop SELF-SERVE FOOD PROTECTION. The program is called Hazard Analysis Critical Control Point (HACCP). This program (HACCP) is used by food processors and the foodservice industry.

##### Hazard Analysis Critical Control Point:

HACCP is a systematic approach to food safety. The HACCP program was first developed to control the quality of foods used in the space program. Since then, it has been applied to many types of foods in different food production settings.

HACCP is a method to help guarantee food safety. The concept is organized into seven basic principles,:

1. Assess hazards of foods from growth to consumption.
2. Determine critical control points needed to control the hazards. (Critical control points are procedures or points where a loss of control may result in a health risk.)
3. Establish the limits to meet at the critical control points. (Limits may include temperature, sensory evaluation, time).
4. Establish procedures to monitor critical control points.
5. Establish a means of correction when a problem at a critical control point is found.
6. Establish record-keeping systems for the HACCP plan.
7. Establish procedures to confirm the HACCP system is working.

1 National Advisory Committee on Microbiological Criteria for Foods. Hazard Analysis and Critical Control Point System. United States Department of Agriculture, Food Safety and Inspection Service. Adopted November 1989.

**Recommended References:**

Bryan, F.L.: Procedures for local health agencies to institute a hazard analysis critical control point program for food safety assurance in foodservice operations. J Environmental Health 47:241, 1984.

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Guzewich, J.J.: Statewide implementation of HACCP food service regulatory programs. J Environmental Health 49:148, 1986.

Snyder, O.P.: A management system for foodservice quality assurance. Food Technology 36:1, 1983.

United States Department on Agriculture, Food Safety and Inspection Service: A margin of safety: the HACCP approach to food safety education. July, 1989.

**FOOD TAMPERING HAZARD  
INSPECTION FORM**

299

*"Food tampering is the intentional contamination of foods  
to cause or threaten illness or injury to consumers."*



*developed by:*

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## FOOD TAMPERING HAZARD INSPECTION FORM

Several weeks ago you filled out and returned a questionnaire on *food tampering*. Thank you for being a part of this national study on *food tampering* prevention in foodservices, especially those with self-serve foods. This Inspection Form follows the questionnaire. Please use the Inspection Form to rate the *food tampering* hazards which may be in your foodservice.

Directions: Select one feature in each section which best describes your foodservice. Circle the matching number in the Tamper Value column. If more than one feature applies, circle the highest value. Add the numbers you circle to get the score for your facility. Check your score with the Food Tampering Hazard Rating listed on the last page. Please return this form in the postage-paid envelope. Thank you!

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YOUR FOODSERVICE FEATURE	TAMPER VALUE
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Section 1: Self-serve menu items

Complex preparation: several ingredients;  
many steps and much handling to prepare.

Example: potato salad, casseroles . . . . . 4

Simple preparation: single or few ingredients;  
limited handling to prepare.

Example: salad bar toppings, roast beef. . . . . 2

No preparation: portioning only.

Example: chips, nuts, whole fruit. . . . . 1

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Section 2: Source of self-serve food

Transported from central kitchen,  
already prepared. . . . . 3

From supplier, already prepared. . . . . 3

Prepared in-house. . . . . 2

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Section 3: Entry to kitchen and access to back-up foods

Entry into kitchen by unauthorized people occurs. . . . . 5  
Example: customers, friends, off-duty employees,  
allowed in kitchen or storage areas.

Sometimes unauthorized people in kitchen. . . . . 3

Entry is limited to on-duty employees . . . . . 1

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<u>YOUR FOODSERVICE FEATURE</u>	<u>TAMPER VALUE</u>
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Section 4: Food protection

Foods often are left on the dock, left unprotected during preparation, or serving and not watched by employees . . . . . 5

Foods are sometimes not watched and left on dock, left unprotected during preparation, or serving. . . . . 3

Foods are not left unattended; policy for employees to watch food even during self-serve. . . . . 1

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Section 5: Observation of back-up food while stored

Back-up food for self-serve is located where it is hard for management or employees to observe; seldom observed, or not at all. . . . . 5

Back-up food area is sometimes observed. . . . . 2

Back-up food area is in clear view of management or employees; is continuously observed. . . . . 1

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Section 6: Type of customer self-serve

No serving utensils, use hands  
Example: bowls of chips, nuts, mints. . . . . 5

Appropriate serving utensils provided. . . . . 2

Mostly self-serve with some items served by employee  
Example: carved ham, beef, brunch omelettes . . . . . 1

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Section 7: Food protection during self-serve

Uncovered, unwrapped, or open containers of foods. . . . . 5

Combination: open and protected foods. . . . . 4

Sneeze shield and/or lids, covers on all foods. . . . . 1

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Section 8: Observation of self-serve food area

Self-serve area not regularly observed by management or employee. . . . . 5

Employee observes self-serve area along with other duties. . . . . 2

Employee attends or observes self-serve during serving hours; continual observation. . . . . 1

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YOUR FOODSERVICE FEATURE TAMPER VALUE

Section 9: Food protection inspection (before serving)

- There is no policy for inspecting foods before serving; foods are rarely inspected. . . . . 5
- Sometimes foods are inspected before serving. . . . . 3
- Self-serve foods are routinely inspected before serving.  
Example: check temperatures, appearance, packaging for evidence of tampering. . . . . 1

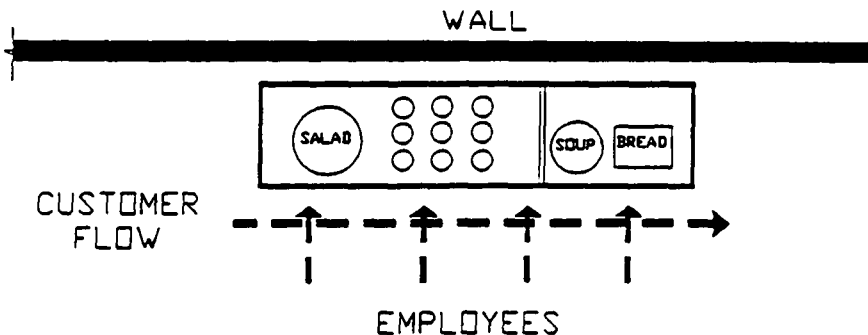
Section 10: Food protection inspection (during serving)

- Foods are not inspected during self-serve. . . . . 5
- Foods are randomly inspected during serving time. . . . . 2
- Foods are regularly inspected (more than once) during self-serve.  
Example: check appearance for evidence of tampering, temperatures. . . . . 1

Section 11: Design of self-serve area

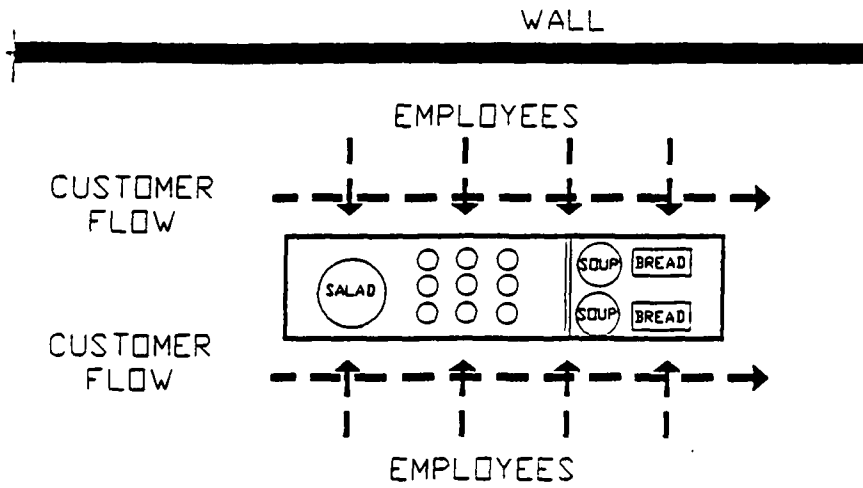
Four examples of self-serve area floor plans are given. Choose the plan which is most like your foodservice. If you have more than one type of self-serve, choose the plan with the largest number in the tamper value column..

Example 1. . . . . 5

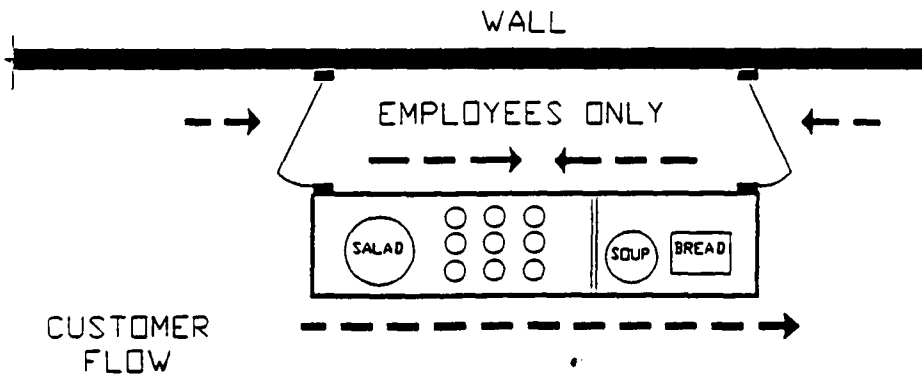




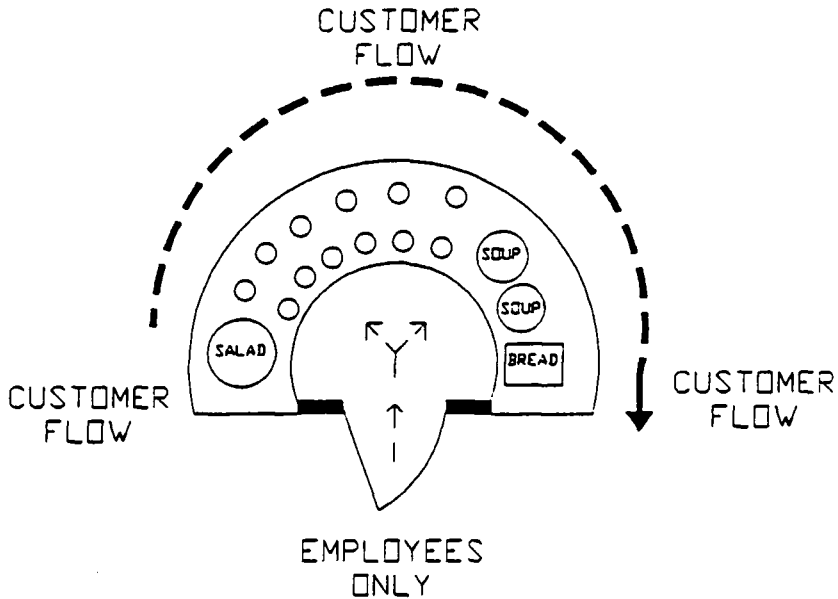
Example 2. . . . . 3



Example 3. . . . . 1



Example 4. . . . . 1




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Add circled TAMPER VALUES from pages 1 through 5 . . . . . YOUR TAMPER VALUE SCORE

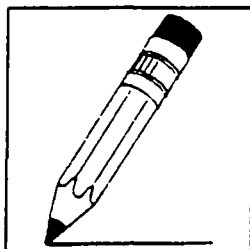
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Scoring code for TAMPER VALUE score                      Food Tampering Hazard Rating

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- 51-62. . . . . .Greatest chance of food tampering
- 21-50. . . . . .Moderate chance of food tampering
- 12-20. . . . . .Least chance of food tampering

What the scores mean: The scores are a way to evaluate your foodservice's Food Tampering Hazard. Scores show how much control you have for self-serve food safety. The highest rating does not necessarily mean that you will have a food tampering event. Likewise, the lowest rating does not mean that you are completely protected from food tampering. Scores show possible hazards of food tampering.



Please answer the following questions:

1. Which of the Sample Plans (pages 3-5) in the Food Tampering Hazard Inspection Form has the greatest food tampering hazard, Plan 1, Plan 2, Plan 3, or Plan 4? (Circle one number)
  - 1 PLAN 1
  - 2 PLAN 2
  - 3 PLAN 3
  - 4 PLAN 4
  
2. Generally, how concerned are you about the possibility of food tampering in your foodservice? (Circle one number)
  - 1 VERY CONCERNED
  - 2 SOMEWHAT CONCERNED
  - 3 NOT AT ALL CONCERNED
  
3. How has your concern about the possibility of food tampering in your facility changed after completing the Food Tampering Hazard Inspection? (Circle one number)
  - 1 CONCERN IS GREATER
  - 2 CONCERN IS LESS
  - 3 CONCERN HAS NOT CHANGED, SAME
  
4. Do you think that in-house inspections, such as the Food Tampering Hazard Inspection, can help reduce the possibility of food tampering? (Circle one number)
  - 1 YES
  - 2 NO
  - 3 DO NOT KNOW
  
5. Is monitoring the same thing as inspecting in a foodservice? (Circle one number)
  - 1 YES
  - 2 NO

6. If you believe that there is a possibility of food tampering hazards in your foodservice, what action would you take? (Circle one number)

- 1 THERE IS NO POSSIBILITY
- 2 DO NOTHING AND ACCEPT POSSIBILITY
- 3 MAKE CHANGES TO REDUCE THE POSSIBILITY

6a. Please identify whether or not you might make the following changes. (Circle one number for each)

	YES	NO
a. Implement in-house inspections for food safety. . . . .	1	2
b. Discontinue use of self-serve foods . . . . .	1	2
c. Increase labor for supervision of the self-serve food area . . . . .	1	2
d. Buy or modify self-serve equipment . . . . .	1	2
e. Redesign self-serve area by changing floor plan . . . . .	1	2
f. Other (please specify) . . . . . ( _____ )	1	2

7. How much of the notebook, SELF-SERVE FOOD PROTECTION: Food Tampering Protection for Self-Serve Foods, did you read? (Circle one number)

- 1 75% TO 100%
- 2 50% TO 74%
- 3 25% TO 49%
- 4 LESS THAN 25%

Is there anything you would like to say about Food Tampering in foodservice?

Thank you for completing the Inspection Form and questions. Please mail this completed form using the postage-paid envelope. The extra blank form is yours to keep. Please call Victoria Look at (503)-737-0961, Oregon State University, or (503)-926-1680 if you have any questions or comments.

THANK YOU FOR YOUR PARTICIPATION!

APPENDIX G

Respondents' Comments about Food Tampering,  
Phase 1

Phase 1  
Comments Regarding Food Tampering:  
Respondents WITH Self-Serve Foods

- 0061 Salad bars are of major concern. It is like a time bomb!
- 0076 I feel that there is not a problem at our location, but there are problems out there. We try to pride ourselves on our cleanliness, & quality. Each day our salad bar is checked and after each person uses a finger foods bowl at the bar the remaining food is thrown out.
- 0087 I am very interested in In-House training manuals and seminars for my staff. I feel that training our associates will be very beneficial to our associates and guests. Any info please advise. Thanks. Sorry I am late getting this survey back to you.
- 0105 It has been my understanding that food tampering is largely the work of unbalanced/vindictive people. All the safety precautions in the world wouldn't prevent the occasional food tampering case. Perhaps this is a problem more wide spread than I was aware.
- 0112 I believe every county should implement a mandatory food service sanitation certification course. That every food service establishment should have a certified food handler on premise. Our county adapted a certification course some years ago. It has proved to be successful. I not only have one, but five people on property I have put through this course.
- 0120 We have a catering service, so therefore, in our facility only our employees are there, so it is not a factor. However if we had a restaurant, it would be a concern. Because of being an off premise caterer, a lot of questions do not pertain to us and therefore are difficult to answer from our view. For example, most of our buffets are self service but we have employees attending our food lines constantly.

- 0274 We do all we can to ensure we provide fresh food in a clean and sanitary environment. I do however realize there is the potential for tampering in our salad bar, but no more risk than with any restaurant, drugstore, grocery store, or anyone who sells products to the public.
- 0281 The food service industry requires hands on management with fixed responsibilities. The manager must continually look at improving the physical operation in the delivery of the product in a safe manner to the consumer.
- 0386 We are very concerned with food service sanitation & safety. Any retail food service operation has an obligation to serve clean and wholesome food. Each of our 5 deli and bakery managers has gone to food service safety education class. Each of our full time employees has gotten some sort of education on food service, either through our in-house program or vendor sponsored programs. We are currently developing inspection within our system to improve quality which involves food safety.
- 0398 Proper design for visibility and access are the key. If someone truly wants to cause harm by tampering or contaminating food there is not too much you can do. Casual or deliberate pranks are a problem that can be decreased, but planned acts to do harm are almost impossible to stop. The food poisoning of salad bars in Wasco County Oregon by part of a religious cult is such an example.
- 0419 Our company, Dairy Queen, has a very good inspection, a lot more than the county. I believe most of the large chains have strict inspections.
- 0457 It seems that publicizing this type of thing increases the possibility of it occurring and in many cases unnecessarily creates anxiety among the public.

- 0486 I would like some inspection forms mentioned in this questionnaire. Could you put them in contact with me for our local area. Thank you.
- 0517 Question 7 doesn't state whether the intent of an in-house inspection program included preventing tampering. Absent that specific intent, I doubt it would reduce the risk. 9B - I'm not sure what you mean by "potential"; risk and potential are similar words. There is always "risk and potential" for food tampering. The degree of that risk is too low to be cost-effectively addressed. If that situation changed (which is unclear in the question) I would then take measures to address it.
- 0527 I do not believe there is a problem. There are risks with everything you do. It is part of life. We don't need more regulations initiated by do gooders! Leave well enough alone. I have 30 years of college food service experience and I say there is no problem.
- 0531 Would like summary of findings.
- 0542 Tampering occurred several years ago. Nothing recently.
- 0548 I feel in all fairness to your survey, you must take into consideration the hourly food service employee. Questions regarding their quality of food handling and training received should be addressed. Self-serve food areas do pose a greater potential for food tampering; however, it is no great surprise that the average education level of a food service employee carries on much past high school. Many, especially those who are improperly trained, are conscious of their routine actions and how they effect the quality of food which is served. Areas of concern: 1) Do food service managers/supervisors feel secure about the training their employees have received? 2) Are in-house inspections performed by non-biased personnel within the facility to back up or contradict inspections performed by food service personnel? 3) How well is access to food production areas controlled?



- 0566 In de-centralized kitchens where pantries are on each unit, there is a great potential of food tampering. We, as a hospital, should spend more in the area of food protection, especially where visitors etc. are permitted.
- 0579 I am not terribly concerned about food tampering because our operation serves a very small population (50 students at each seating). The dining room is small - we know each student by name. Our staff has virtually no turnover, and basically food tampering is the least of my concerns.
- 0601 I do not feel we have a problem in this area at this time. I can see how this might be a problem in a metropolitan area. Self serve helps our labor cost and satisfies our customers.
- 0615 We have problems with our self serve frozen yogurt machine and cola unit. Suspect either product comes in bad, machine isn't cleaned properly and/or have seen customers lick yogurt on cone and re-supply cone by tricking yogurt on cone with dispensing unit. We also suspect at times angry employees (cook) sometimes place non-edible items in food, but think most times we find employees are careless, e.g. plastic bag tag from rolls was found on hamburger between cheese and hamburger.
- 0617 Sorry you needed to send so many reminders, it did demonstrate how important this survey is to you.
- 0619 As a management dietitian, industry should offer more in-services to supervisors/managers on this aspect. Most ADA and ASFSA seminars/conferences are on clinical trials, on clinical nutrition, rather than the administrative portions of it.
- 0627 This survey was sent to my old boss - K. Morrison. My new boss asked me to complete it. Kathryn Marko at NNMC Bethesda, MD 20889-5000.

- 0639 Our operation is in a small community, feeding the same students/faculty at each meal although we serve all self-serve foods, there is no evidence of great risk of food tampering. Greater risk of food contamination by hands going into bowls, etc.
- 0644 I would be interested in the conclusion of the survey.
- 0660 Indoctrination and close supervision of employees and customers work best for us, in a non-malicious atmosphere. Maintaining interest on the part of the administrative staff is a strong recommendation. Though I am 4 years past full retirement, I fear I am more concerned than ever. (And bug my staff more!)
- 0697 Food tampering is potentially a 'real' problem. However, the public demands self-service bars.
- 0714 Would like a copy of the summary of your findings/results/conclusions and recommendation. I'm sure others who took the time to complete the survey would feel likewise.
- 0739 Very interesting research. Will a copy be made available of the results? If so, please send. Thank you. Self serve counters hold great potential for tampering. However, the cost of constant surveillance is unreasonable. I'm not sure what the answer would be.
- 0748 A worthwhile study. I wish you well. Can you share results?
- 0757 Would like results of survey.
- 0770 Because of the number of agents available food tampering can occur in the blink of an eye. Increased supervision would not always help. The design of the area and non-intrusive means of detection would be more effective. Non-intrusive methods like mirrors and or video cameras will help in my opinion reduce the possibility of such an occurrence.

- 0774 This has not been a problem here. I do not feel you could ever eliminate tampering totally. If someone wants to do it, they will find a way regardless of inspections, set up, laws etc.
- 0789 We are always concerned about safe handling of food by the workers but I'm not aware that there has been "food tampering" in the Midwest. I can see how it would be so easy for someone to do this. I am very interested in learning more about where this is happening and what kind of precautions and changes a facility is having or going to have to do to protect their customers. I would appreciate more information or reference to info on the subject.
- 0801 I am not aware of any incidents in our operation where food tampering was a problem. It may be due to the Air Force environment and we cater on-base.
- 0823 In Chicago all food service facilities are required to have a city-certified supervisor on duty at all times. Certification courses cover sanitation, food handling.
- 0825 We are located on the largest Arsenal in the United States and though there have been bombs threats etc., we have had no known threats or problems.
- 0828 The Tylenol and Legionnaires Disease situations have made it clear that tampering and unforeseen health hazards can occur, no matter how diligent the manager and staff of the operation. We all act on faith that in each step of the food chain diligent care was taken to protect the consumer. Yet proper controls in food service require inspection of the food received, hiring and training qualified, competent employees, adhering to standards, monitoring work habits, etc. In 20 years in food service management, I have not had a reported instance of illness related to the food. Many times I, or my staff have used the saying "If in doubt, throw it out."

- 0833 The area of food tampering is a disaster waiting to happen. I've always been amazed that it hasn't become a fad with the psycho's, once it happens it would become a quick 'copycat' thing, and that's scary.
- 0836 I have had real concerns because we have a self serve deli bar, salad bar, bread bar, frozen yogurt, candy bin, and fruit cobbler. Do not have staffing to always observe customers.
- 0840 Concept of food tampering is new to me. Have never really thought about it as a possible problem. But I guess it is just waiting to happen. Our Q.A. programs aim to maintain food quality.
- 0843 Proper utensil usage, proper temperature of salad bar, method of displaying food in salad bar, discussion of breakfast bars.
- 0848 We film wrap cut pies, cakes, donuts, and sweet goods. Serve packaged jelly, syrup, butter, crackers, sugar, sweetener for hot beverage, plastic ware, desserts, and most salads, except salad bars.
- 0849 As a midwest state with predominantly Nebraska students, we have limited cause for concerns researched in this survey. All of our service has been converted to unlimited self service.
- 0850 Food tampering, food safety are both areas of increasing concern but must be handled with continued awareness and education. Water and food cost are going to be escalating and the total area will need to be more scientifically monitored to ensure continued safety.
- 0902 Food tampering is a concern, but there is not a lot that can be done to stop it if it is a malicious attempt to cause harm. Most any system derived can be circumvented by a sick individual who wants to cause harm.

- 0912 Your survey did not address another method of food tampering. We have not had any food tampering occur at our institution, but have received some products from vendors that may have been tampered with, for example: A customer returned a piece of pie with a 1 inch nail in it. We have found other 'foreign objects' in various products purchased from food manufacturers.
- 0919 We have had no threat or reports of a problem with food tampering in this area. I surely hope it doesn't become prevalent.
- 0931 If people go to great lengths to tamper with medicine they could easily tamper with food. I think that carry-out foods (pizza, etc.) are at more risk, but not likely since the offender could be traced much faster! While serving in Saudi Arabia during the Persian Gulf War we sat down with Intelligence Officers to figure out ways to prevent sabotage of all water (both bottles or well water) and food being used. What resulted from our investigation is classified, but I can say the price we paid to prevent tampering was well worth the effort! Our lives could have depended on it! We had to be much more careful and observant of everything that went on in our operation. We tightened controls not only on materials, but on all people also. (Both outsiders and insiders.)
- 0936 Although the potential exists for food tampering fortunately it has not gained popularity. From the incidents of tampering with medicine, this could become a real problem. In a University environment I don't feel the potential is high but one case, especially one involving death, would be one too many. I am very interested in seeing the results of this survey.
- 0959 Navy facilities are monitored very closely for safety/sanitation violations. We are inspected every 2 weeks by a Prev. Med. Inspector in addition to our own in-house inspections.

- 0962 I would insist upon all food service management doing walk-throughs every hour of their shift. By doing this, management would be visible to the public, and aware of the surroundings.
- 0975 I am not aware of food tampering and would like more information before answering questions.
- 0979 A recent trend in non-vegetarians adding meat from salad bars to vegetarian soups for reasons unclear to us.
- 0988 Food tampering could be done by a customer without a food service staff person seeing it. Self-service menu items are always at risk. Besides the reduced labor factor, self-service items are very popular. It would be very difficult or impossible to make self-serve menu items safe from food tampering. If food tampering was a real threat the decisions that would have to be made would not be easy.
- 1000 Restaurants and cafeterias supply more safety in self-serve foods vs the grocery stores, who offer large salad bars with high sneeze guards. Customers can be seen on a regular basis using hands, not utensils, picking a piece of this or that out of the salad bar. I have also seen patrons "finger dip" in self serve soup pots in grocery stores, but never in restaurants. Grocery stores leave foods unattended for hours. People when shopping tend to handle the merchandise even on self serves. Children in shopping carts are just at the right level, below sneeze guards, to grab or dump anything into or out of the food bars. Self serve in grocery stores is a huge problem waiting to happen. Self serve in cafeterias and restaurants still run a risk of tampering, but I feel, they are watched by management more closely. It's our only source of income, and cared for by more employees walking the area. Patrons expect more from restaurants/cafeterias and I feel they more often than not get it. Single portion items are also more available to food service - provide less of a chance. If someone really wants to tamper - they will - regardless of floor plan or labor. I just believe there's less chance of it happening in a

more controlled area, i.e. restaurants and cafes  
- vs. - the self serve in grocery stores. Then  
again, if someone really wants to tamper - what  
faster way than through a large busy kitchen??!

Phase 1  
Comments Regarding Food Tampering:  
Respondents WITHOUT Self-Serve Foods

- 0015 As I run a 10 room country inn that basically feeds the guests in-house, I know little about your subject & so did not respond to your 1st questionnaire - your persistence convinced me to try but I know I cannot answer all questions.
- 0032 Unless all self serve is eliminated, there is no protection against tampering. For conventional service, tampering by disgruntled employees is not rampant as of yet, but could be if economy stays poor and employees paid at lower levels take out frustration (as have white collar employees against computers etc.)
- 0035 Lots of luck, but I honestly feel if some nut wants to tamper, you're not going to stop him or her. They might take your attempt as a challenge!
- 0283 Just as any determined individual can find a way to pass out poison, any bureaucrat with enough time on his or her hands can come up with a study showing the need for something which will lead to new regulation and an overall cost increase to business.
- 0289 I would personally never ever use self serve foods because the quality is not there. The customer wants fresh product served fast & friendly as possible. Self serve products have just too much waste & over portioning.
- 0294 We are not a large community, a college town with very little crime. (We have not had a murder in 5 years.) Deliberate food tampering seems low risk, but I have read about accidental tampering in our area. Hope you learn ways to help protect the public. Best of luck.
- 0313 Our operation does not and never has had any type of self serve other than honey and ketchup on the table. This has always been a concern of mine.



- 0328 I believe self-serve food bars, etc. to be very unsafe.
- 0344 Another facet to think about. Thanks for the inspiration.
- 0356 An alert staff and management concerned for all aspects of guest health and welfare should be able to spot any spoiled/rotten food and protect customers from any intentional food tampering.
- 0362 It seems the teenage help tend to think of it as pranks and funny more than a major problem. Things like spiting in food or hot spicy, etc.
- 0365 You can not stop sick people from contaminating food, if they are set on doing it.
- 0372 Your questions appear to be weighted towards a controlled inspection system rather than neutral.
- 0399 Food tampering can not be prevented if there is serious intent. Casual or prank tampering can be controlled by design and supervision. We do not need any further regulation, law, or control!!! Advise and guidance are great. Your survey is somewhat deceiving in intent and question. What are you after? I would like a reply.
- 0401 Food tampering, I believe, can not be stopped if someone is intent on tampering! The more said about it, the more attention is drawn to it, and the more it happens! Making some third rate 'manager' or 'alien' responsible means nothing. Responsibility in this day and age is a joke. One should take logical steps with the employees, keep it low key, common sense sanitation and hope for the best.
- 0409 I prefer my kitchen prep persons to wear gloves when preparing meats, poultry, seafood and fish. None of these items should be out of refrigeration for more than a few minutes at a time. We ice our seafood everyday to retain quality and do not over stock these items.

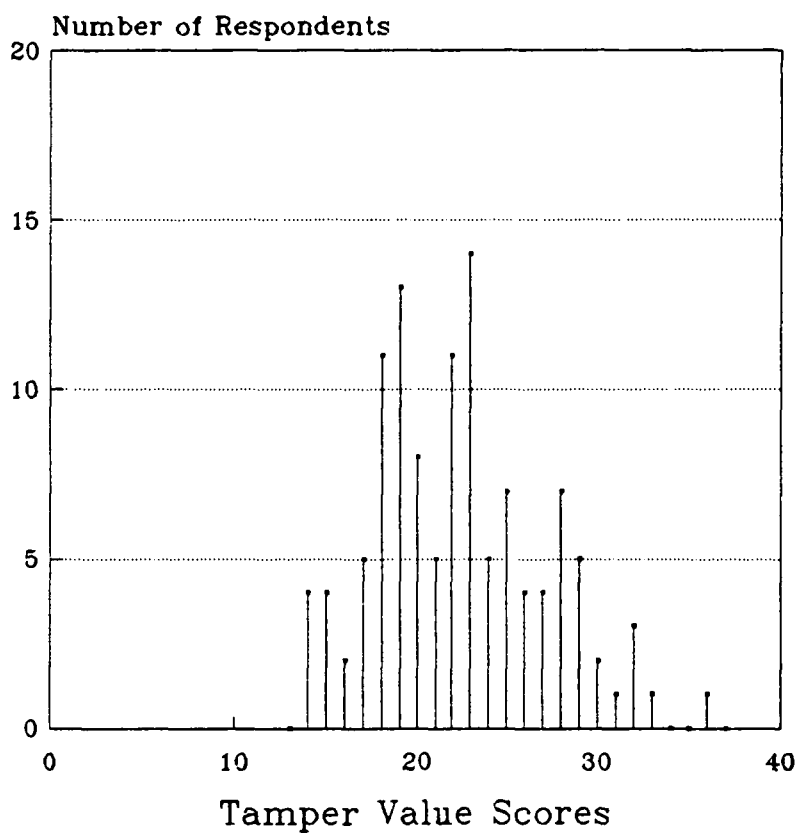
- 0421 Oregon has had only one food borne contamination problem related to known tampering. This occurred in The Dalles during the mid-1980s. Salad bars were the target and were infected while in place in the salad bars. Many were sick in the area.
- 0423 Food tampering at the serving level is never fool-proof, in my opinion. Any time there is exposure to the public, such as self-serve foods, there is a risk of food tampering. If someone is determined to contaminate a food source, they have a better than 50% chance of fulfilling their goal, especially where self-service is involved.
- 0449 The only comment I would like to make about food tampering (or any other kind of tampering) is that without "The Media" publishing the results, you would have none or close to zero tampering. There would be no incentive to tamper. There would be no teaching that tampering is successful in terms of effecting many people without doing much. Food tampering is not something that had even occurred to me until I read this questionnaire!
- 0481 I would like to see improved inspections by Health Departments, on a regular basis. I believe this would help sanitation and safety, improved by having operations be more aware, more on-guard to health and safety of food operations.
- 0495 I'm sorry we really can't file a good report, as we don't have a restaurant. I had never thought about food tampering in a restaurant. I believe I did send you a note. I did my best. I'm sorry I couldn't be of more help.
- 0630 I just want to know more!

- 0708 Self service affords a much greater number of people the opportunity to tamper with food. We discontinued self service in Nov 1991 due to strong concerns over safety/sanitation. We observed tremendous amount of handling/touching of food. The risk of tampering is very real. To avoid/minimize in-house tampering by food service staff, in-depth pre-employment screening is essential.
- 0744 I'm totally against self-service facilities. We work closely with our local sanitation department and with the amount of reported potential problems in that area, it would seem foolish to set yourself up for those types of hassles. I've gone as far as dissuading our students from offering a salad bar etc., because of the possible risk to public health due to food tampering.
- 0750 Food tampering can happen at any time, at any type of Food Service establishment, not only self-serve foods. Please keep in mind that food tampering cannot be accidental, rather there is always a reason.
- 0911 We are a psychiatric hospital. We have ten cafeterias but all food is portioned and served by our staff.
- 0918 Something you didn't address in your questionnaire is the importance of proper employee screening as a way to reduce risks.

## APPENDIX H

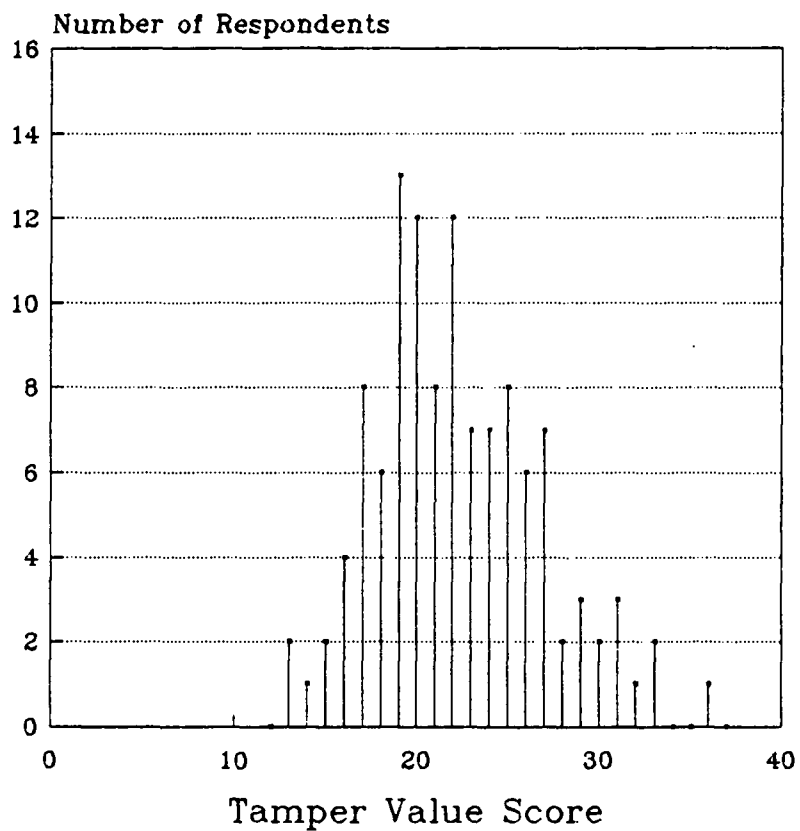
Mean Tamper Value Scores  
of Experimental and Control Groups, Phase 2

## Tamper Value Scores\* Experimental Group



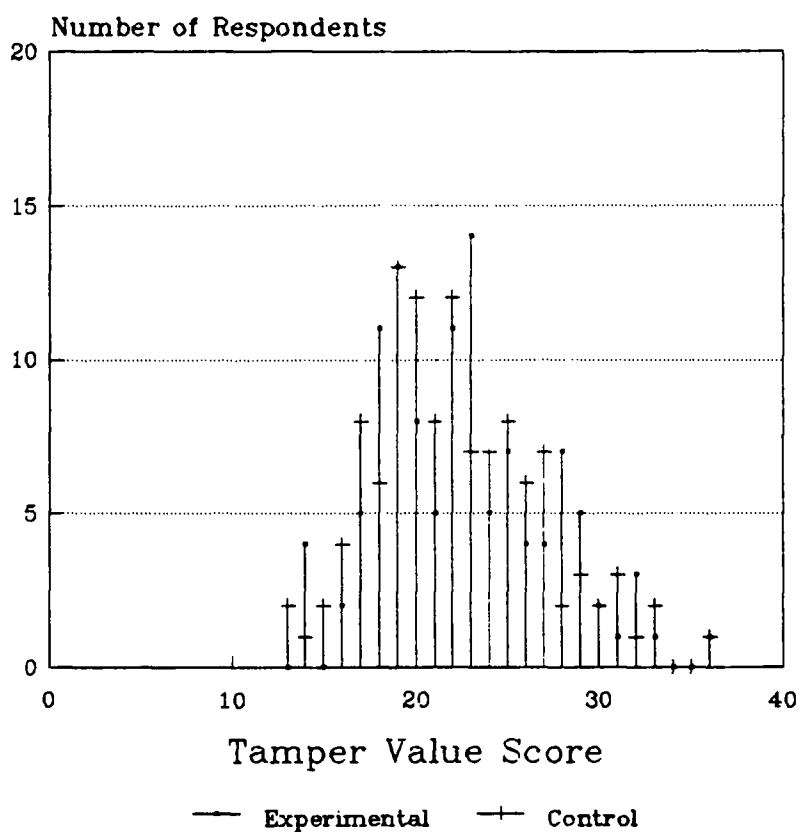
\*total of post-test sections 1-11  
n=117; mean=22.3

## Tamper Value Scores\* Control Group



\*total of post-test sections 1-11  
n=117; mean=22.2

## Tamper Value Scores\* Experimental and Control Groups



\*total of post-test section 1-11  
n=234; mean=22.3



APPENDIX I

Respondents' Comments about Food Tampering,  
Phase 2



IS THERE ANYTHING YOU WOULD LIKE TO SAY ABOUT FOOD TAMPERING  
IN FOODSERVICE?

- 0044C We tried to discontinue salad bar for approximately one year. But got numerous complaints and loss of business till we brought it back.
- 0046E Up to this point in time (over 30 yrs) we have had no food tampering.
- 0120E What about food tampering at the Distributor Level?
- 0326C Most of the suggestions you have made are already in place. In a small town in Central Nebraska tampering is not a problem. Your money could be better spent doing something else.
- 0386C Food Tampering prevention program is one obligation we have toward our customer. A good program will give you long term results and keep you in business forever.
- 0417C Possibility seems quite remote & if someone really wanted to tamper you could probably not stop them.
- 0418E Good luck, and keep the health department from using this tool as a way to harass establishments.
- 0431C In 20 years in food service industry, I have not considered this a problem.
- 0465C Our risk is very low, because we don't have a salad bar or hot food bar. We only have serve yourself hot sauce and catsup. We have never had any trouble, but we are changing our design before we do.
- 0502E Good info. Thanks.
- 0517E I see a problem with self serve salad/soup bars. Tampering could occur. Risk is very low with grill and hot entree because those areas are continuously staffed.
- 0518C Tampering is an area in which foodservices are extremely vulnerable. The "Tylenol" case of tampering changed the OTC packaging; a similar case could radically change the entire self serve segment of foodservice. I'm surprised that more stringent requirements haven't been enacted.
- 0527C It is not a problem or concern.
- 0541C It is always a possibility, never take it for granted that it couldn't happen.
- 0542E Problem is of most concern during 11pm to 7am shift. Supervisor and monitoring are minimal.

- 0543E We do not allow students to bring any item in the Serving Area. Serving Area entrance is restricted.
- 0557E I believe it happens more than people realize. We also work at a psychiatric hospital where patients have open access to many foods. This increases the risk.
- 0606C Good work, thank you.
- 0614E What about tampering by your own employees?
- 0616C As budgets become tighter in healthcare food service, there's a real trend toward increasing self service activities to help reduce labor costs. This increases the risk of food tampering. More education is needed in this area to make the provider of food service aware of these risks and how to protect one's operation.
- 0633C Thanks for the info. I would be interested in reference sources to help in planning.
- 0646E People monitoring combined with close supervision by trustworthy employees & supervisors, along with alert management should prevent, in most cases, any tampering with self serve items.
- 0648E We as responsible food directors better be aware of this possibility and take whatever action is necessary depending on type of service, to cut down or eliminate tampering possibility.
- 0698C It's as easy to train employees to do it right as to let them do it wrong.
- 0727E With labor becoming a big issue, I see food tampering as a major concern. You are always being asked to reduce staffing, therefore there is less monitoring of these areas.
- 0745C Self serve is only a portion of the opportunity for food tampering in foodservice. We are very much at the mercy of our employees, vendors and their employees as well as the almost nonpreventable unauthorized people getting into our kitchens and prep or serving areas.
- 0755C We are in a small rural community and thus far have had no problems at all.
- 0756C I feel there are few ways to stop food tampering if an individual is determined to do so. Even large drug companies have not been able to stop it. The hope is, that most people can be trusted.
- 0772C Not a problem but frightening.

- 0789E Make more people aware of the possibility especially restaurants.
- 0800E Thank you for making us take a more critical look at ourselves.
- 0801C I feel the key is to make employees aware of the possibility that food could be stolen.
- 0828E A few days before receiving the information, I observed an employee from another part of the building attempting to put chocolate syrup on self-serve yogurt. When the syrup would not come out of the squeeze bottle, he used his mouth to open the spout. When I pointed out to him what he had done, he said he didn't realize what he had done! Definitely points out continual need for observation.
- 0830E This is an excellent training tool. My awareness of factors contributing to food tampering has certainly changed, and I hope to use some of these materials in inservice staff training.
- 0833C Probably in most operations there is a fair chance one may be hit by disgruntled employee or customer. I think it is good to be aware it might happen. I just have a unique situation here, no I'm not worried.
- 0839C I feel that if the Director has capable employees and trains them well, then food tampering is not an issue. If the Dietary dept is run by a good staff who are alert to customer's needs, the dept is always monitored.
- 0843E What is the recourse if someone tampers with food. What type of tampering have you come across?
- 0850C Needs continual checking - everyone needs to be aware of the possibility.
- 0857C We are so small. It would be hard for someone to tamper with the food.
- 0861E It is a topic that I have not given much thought to but could definitely be one that we should be more informed about.
- 0864E Well designed, informative, will make excellent source of inservice.
- 0868C Enlightening! Thanks.
- 0902E In our hospital and our community the risk of tampering is almost nil. If someone really wanted to tamper with the foods, they could find a way regardless of any measure to prevent it.

- 0907C We are so vulnerable to food tampering that it is one of the most dangerous arenas of a food service operation. As we do not have 100% control of preventing it from occurring.
- 0912C We have had products from our food vendors come in with foreign objects in them such as pies and frozen soup.
- 0915E Even though we have separate utensils for each item in the salad sandwich bars, customers will use same utensil for several items or use their fingers. I have threatened to use or take finger prints with culture plates when I see people doing this.
- 0931E Being a military unit the possibility is there, but the chance of it happening with our customer flow is slight.
- 0939E Thanks for the information.
- 0944C Please do not send any other info.
- 0959C We are a govt. inspected operation aboard a US Navy Base. I think our constant monitoring of self-serve areas and using the correct equipment and layouts reduces our risk enormously.
- 0963E Must include other departments besides dietary in a hospital. Must be able to determine if food was tampered with or if it could be food borne poisoning.
- 1000E Even "if" we made all changes to protect foods, it can still happen. Poisons added to foods won't be found by sight or temporary monitoring of extra personnel. Foreign objects could be found in foods with inspection. Sneeze guards and proper utensils won't stop germs and can actually provide system for transferring germs or hazards to foods. Long as there are people involved with consuming, self servicing or preparing foods there will always be a high chance of tampering.