

FOOD DEFENSE MANAGEMENT PLAN IMPLEMENTATION INTENTION: AN
APPLICATION OF PROTECTION MOTIVATION THEORY

by

EUNJU YOON

B.S., Kyonggi University, Korea, 2000
M.S., Purdue University, Indiana, 2003

AN ABSTRACT OF A DISSERTATION

submitted in partial fulfillment of the requirements for the degree

DOCTOR OF PHILOSOPHY

Department of Hotel, Restaurant, Institution Management & Dietetics
College of Human Ecology

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2007

Abstract

Protection motivation theory (PMT) was used in this study to investigate foodservice directors' food bioterrorism risk perception and their intentions to implement a food defense management plan in their operations. A cross sectional study using the self administered survey was conducted to test hypotheses. All measurement items for the construct of interests were assessed using a 7-point Likert type scales. Questionnaires were mailed in March 2007 to a national sample of 2,200 randomly selected on-site foodservice directors employed in school districts and healthcare operations. A total 449 usable completed questionnaires were received. Descriptive statistics were performed to investigate directors' perceptions, motivations and intentions independently. Before testing the actual hypotheses, confirmatory factor analysis was conducted to assess reliability and construct validity of the measurement model.

Foodservice directors perceived that the result of a food terrorist attack would be severe but the chances it would occur in their operations is limited. They agreed that implementation of a food defense management plan would be effective to address food terrorism issue in their operations. They were highly motivated to protect the operation from an attack and to avoid the risk of terrorism and intended to implement a food defense plan in their operation.

Based on the hypotheses testing, results revealed that motivation to protect the operation against food bioterrorism is higher when directors perceived a higher level of risk (severity and vulnerability), rated the effectiveness of a food defense management plan in protecting the operation high, and perceived that their operations were able to implement it. In turn, high level of motivation to protect the operation led to higher level of implementation intention.

Results of the study can be used to design communication resources developed to enhance foodservice directors' intention to implement a food defense management plan. Educational and informational resources related to intentional food contamination and its defense should emphasize response efficacy and possibility perception.

FOOD DEFENSE MANAGEMENT PLAN IMPLEMENTATION INTENTION: AN
APPLICATION OF PROTECTION MOTIVATION THEORY

by

EUNJU YOON

B.S., Kyonggi University, Korea, 2000
M.S., Purdue University, Indiana, 2003

A DISSERTATION

submitted in partial fulfillment of the requirements for the degree

DOCTOR OF PHILOSOPHY

Department of Hotel, Restaurant, Institution Management & Dietetics
College of Human Ecology

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2007

Approved by:

Major Professor
Carol W. Shanklin

Copyright

EUNJU YOON

2007

Abstract

Protection motivation theory (PMT) was used in this study to investigate foodservice directors' food bioterrorism risk perception and their intentions to implement a food defense management plan in their operations. A cross sectional study using the self administered survey was conducted to test hypotheses. All measurement items for the construct of interests were assessed using a 7-point Likert type scales. Questionnaires were mailed in March 2007 to a national sample of 2,200 randomly selected on-site foodservice directors employed in school districts and healthcare operations. A total 449 usable completed questionnaires were received. Descriptive statistics were performed to investigate directors' perceptions, motivations and intentions independently. Before testing the actual hypotheses, confirmatory factor analysis was conducted to assess reliability and construct validity of the measurement model.

Foodservice directors perceived that the result of a food terrorist attack would be severe but the chances it would occur in their operations is limited. They agreed that implementation of a food defense management plan would be effective to address food terrorism issue in their operations. They were highly motivated to protect the operation from an attack and to avoid the risk of terrorism and intended to implement a food defense plan in their operation.

Based on the hypotheses testing, results revealed that motivation to protect the operation against food bioterrorism is higher when directors perceived a higher level of risk (severity and vulnerability), rated the effectiveness of a food defense management plan in protecting the operation high, and perceived that their operations were able to implement it. In turn, high level of motivation to protect the operation led to higher level of implementation intention.

Results of the study can be used to design communication resources developed to enhance foodservice directors' intention to implement a food defense management plan. Educational and informational resources related to intentional food contamination and its defense should emphasize response efficacy and possibility perception.

Table of Contents

List of Figures	x
List of Tables	xi
Acknowledgements	xii
CHAPTER 1 - Introduction	1
Statement of Purpose	2
Purpose and Objectives.....	3
Research Hypotheses	4
Operationalized Model.....	5
Significance of Study.....	5
Definition of terms.....	7
References.....	9
CHAPTER 2 - Review of Literature.....	11
Terrorism, Bioterrorism and Food Bioterrorism.....	11
Categorization of Bioterrorism Agents	12
Consequences of Terrorist Attack.....	13
Estimation of Economic Impact of Food Terrorism	13
Roles of Government Agencies	15
Roles and responsibilities of dietitians and other foodservice professionals.....	18
Theories related to fear appeal and behavior change.....	21
Protection Motivation Theory.....	23
Advantages of using PMT over other theories.....	26
Studies Using PMT	27
Three expected outcomes of the fear appeal communication	28
Threat Appraisal.....	30
Coping Appraisal	31
Relationship Strengths among PMT Predictors	32
References.....	33
CHAPTER 3 - Methodology	39

Population and Sample	39
The Instrument Development	41
Initial Questionnaire Development	42
Measuring Threat Appraisals – perceived severity & perceived vulnerability.....	43
Measuring fear	44
Measuring Coping Appraisals – Response Efficacy, Response Cost, Self-efficacy, and Operational Efficacy	44
Manipulation of Response Efficacy.....	45
Manipulation Check.....	46
Motivation.....	46
Measuring Outcomes of Appraisals – Protection Motivation versus Fear Control.....	47
Current Food Defense/Biosecurity Practice.....	48
Questionnaire Modification	49
Pilot test	49
Data Collection	49
Data Analyses	51
References.....	54
CHAPTER 4 - US On-site Foodservice Directors' Perceptions Related to Intentional Food Contamination and Food Defense Management Plan.....	57
Abstract.....	57
Introduction.....	58
Food Defense	59
Consequences of Terrorist Attack.....	60
Estimation of Economic Impact of Food Terrorism	60
Activities of Government Agencies and the Industry	61
Protection Motivation Theory (PMT).....	64
Methodology	65
Survey Instrument Development	65
Study Samples and Data Collection.....	71
Data Analyses and Results.....	72
Profiles of respondents/operations in hospitals and schools.....	73

Threat Appraisal.....	75
Coping Appraisal	77
Motivation and Intention.....	78
Current Defensive Practices.....	81
Regional differences	83
Types of seminar/training	84
Discussion and Implication.....	86
Limitation and Future Study	90
References.....	93
CHAPTER 5 - Measuring Implementation Intention for Food Defense Management Plan Using	
Protection Motivation Theory.....	97
Abstract.....	97
Introduction.....	98
Literature Review	99
Theories related to fear appeal and behavior change.....	99
Protection Motivation Theory.....	101
Advantages of using PMT over other theories.....	103
Theoretical Framework and Hypotheses	105
Three expected outcomes of the fear appeal communication.....	105
Threat Appraisal.....	107
Coping Appraisal	108
Methodology	110
Research Design.....	110
Instrument Development.....	111
Sample and Data Collection.....	112
Data Analysis and Result.....	113
Measurement Model	114
Structural Model and Hypotheses Testing.....	117
Discussions	120
Study Implications	122
Theoretical Implications	122

Practical Implications.....	123
Limitations and Suggestions for Future Study	124
References.....	126
CHAPTER 6 - Summary and Conclusions.....	133
Findings of the study.....	135
Major Findings.....	135
Risk Perception (severity and vulnerability).....	135
Perceptions related to implementation of a food defense management plan.....	135
Motivation and Implementation Intention	136
The Model Testing.....	136
Other Findings	138
Summary and Discussions	139
Implications and Suggestions for the Future of Study.....	142
Limitations of the Study	145
References.....	148
Appendix A - Questionnaire	150
Appendix B - Information about Food Defense Management Plan (Short form)	161
Appendix C - Information about Food Defense Management Plan (Long form).....	163
Appendix D - Expert Evaluation Form.....	167
Appendix E - Brief Introduction to PMT for the Reviewers	174
Appendix F - Sample Size and Number of Responses from Each State	177
Appendix G - Compositions of Six Regions.....	178
Appendix H - Number of Samples and Responses from Different Regions	179
Appendix I - Regional Comparisons.....	180

List of Figures

Figure 1.1 Operationalized Model	5
Figure 2.1 FDA Budgets and Spending for Food Defense	18
Figure 2.2 PMT (Modified from Rogers, 1983)	25
Figure 3.1 Procedure for Survey Instrument Development	42
Figure 3.2 Procedure for Survey Data Collection.....	50
Figure 3.3 Procedure for Survey Data Analysis	52
Figure 5.1 PMT Process (Modified from Rogers, 1983)	102
Figure 5.2 Operationalized Model for the Study	110
Figure 5.3 Path Coefficients	119

List of Tables

Table 2.1 Bioterrorism Agents and Disease Categorization by Centers for Disease Control and Prevention	14
Table 2.2 Outcomes of fear appeal communications on Extended Parallel Process Model.....	29
Table 3.1 Number of Samples From Different States.....	41
Table 4.1 Demographic Profile of Healthcare and School Foodservice Directors.....	74
Table 4.2 Mean Comparisons for Threat Appraisal Between Healthcare and School Foodservice Directors.....	76
Table 4.3 Mean Comparisons for Coping Appraisal Between Healthcare and School Foodservice Directors.....	79
Table 4.4 Mean Comparisons for Motivation and Intention Between Healthcare and School Foodservice Directors	80
Table 4.5 Frequency of Implementing Twelve Selected Food Defense Practices By Healthcare and School Foodservice Directors	82
Table 4.6 Regional Comparison of Respondents.....	85
Table 5.1 Outcomes of Fear Appeal Communications on Extended Parallel Process Model...	107
Table 5.2 One Sample t-tests for Hypothesis 1 Testing.....	114
Table 5.3 Means, Standard Deviations, and Factor Loadings, Composite Reliability, and AVE for Confirmatory Factor Analysis (N=449)	116
Table 5.4 Correlation Matrix, Means and Standard Deviation of Measurement Model	117
Table 5.5 Testing Hypotheses: Parameter Estimates, Significance and Fit Indices	118

Acknowledgements

It is unbelievable that I am writing acknowledgements today. It has been a long journey that I would not be able to accomplish without many special people who constantly and consistently supported me in many different ways. You deserve my appreciation and recognition.

First of all, I would like to express my sincere appreciation to Dr. Carol Shanklin, my major professor, who is an enthusiastic researcher, an excellent teacher, and a great mentor. I deeply appreciate her guidance, encouragement, support, inspiration, and most importantly for her patience and trust, which helped me overcome many hurdles throughout my doctoral program and made my professional and personal growth possible. I am truly honored to be one of your doctoral students. I will not forget what you have done for me the last few years and will try hard to provide guidance, support, and encouragement to my future students like you did for me.

My special appreciation goes to Dr. SooCheong Jang for his endless support, advice, and inspiration. Without him I would not be able to come to Kansas State University in the beginning and to achieve the professional and personal growth that I have experienced during my doctoral program. Thank you for everything you have done for me. Appreciation is also expressed to the members of my dissertation committee, Dr. Elizabeth Barrett and Dr. Fadi Aramouni, for their valuable comments and feedback as well as their support and guidance.

I am grateful to all my colleagues in Kansas State University for their friendship and mental and emotional support. I was lucky and happy because I had you around me sharing my delightful moments as well as relieving my stressful moments. Thank you very much for your encouragement and empathy. I will miss you!

Lastly, I would like to express my deepest gratitude to my father, Duk Soon Yoon, my mother, Gye Sook Kim, and my brother, Sang Kil Yoon, for always being there and believing in me. Without your endless love and support, I could not have made it. You are the reason I am graduating with my doctoral degree. I love you!

CHAPTER 1 - Introduction

With the events of the last six years, such as the terrorism attack in New York city in September 2001 and hurricanes in the Southeast in 2005, concerns about threats to the safety and security of the food supply have dramatically increased in the United States (U. S.). Food has recently received increasing attention for its potential as a bioterrorism vehicle. Food safety efforts in the U. S. have mainly focused on accidental contamination of food and water. However, threats to the food and water supply can arise from several sources: (1) disasters, (2) food ingredients (allergens, genetically modified organisms, imported food), or (3) food safety/sanitation. Of the three, food ingredient issues and food safety/sanitation are relatively well controlled and monitored by different government agencies. Foodservice operations have developed procedures to control or limit risks associated with food and water contamination. However, the foodservice industry and the U. S. governments are not well prepared for threats related to disasters, whether the disaster is intentional (terrorism) or natural (hurricane, fire, flood) (Bledsoe & Rasco, 2002; Bryant, McEntire, & Newsome, 2005; Hollingsworth, 2002; Stauffer, 2002; White, 2002). Many foodservice directors have developed and implemented disaster management plans and crisis management plans to address natural disasters. However, these plans do not address how to deal with disasters that result from someone's intention to contaminate the food supply and cause harm to consumers. Intentional disasters can be prevented before they happen if an effective plan is implemented. Several research studies have been conducted in agriculture and food science that have investigated different sectors of the food supply from farming to manufacturing (e.g., Berry, 2005; Bryant et al., 2005; Blyn, 2006; Elad, 2005; Meyerson & Reaser, 2002). However, preparedness within the foodservice industry has not been investigated to date. Food terrorism research in the foodservice industry should not be neglected. Foodservice directors should be aware of the risks they face and prepare for any possible threats because they are the last control point in the food chain. Foodservice directors who serve the most vulnerable populations, children, elderly, and patients, should focus more attention on their preparedness for food terrorism threats because an attack will have more

impact on these populations. Therefore, this study focused on food terrorism issues in school and healthcare foodservice operations that serve more vulnerable populations, children and patients.

Today foodservice professionals and dietetics practitioners are strongly urged to implement customized management plans to protect their customers, clients, and employees from potential acts of bioterrorism (USDA 2003; Bledsoe & Rasco, 2002; Bruemmer, 2003; Peregrin, 2002). Although specific acts of bioterrorism have rarely been reported in either retail or institutional foodservice, the possibility that someone could intentionally contaminate foods and beverages served in these operations should not be neglected (Bledsoe & Rasco, 2002; White, 2002). It is unrealistic to expect operations to be 100 percent 'terrorism proof'. However, developing and implementing preventive plans are the most effective and realistic ways to address bioterrorism threats (Bledsoe & Rasco, 2002; USDA, 2003). The primary purpose of this study was to investigate foodservice director intentions to implement a food biosecurity management plan in their operations.

Protection motivation theory (PMT) was used to measure director intentions. According to the protection motivation theory, perceptions related to risk and perceptions related to the effectiveness of preventive measures together form a protection motivation. Therefore, investigation of foodservice directors' risk perceptions of food terrorism and their perceptions about the effectiveness of a defensive management plan should provide more precise information about how likely the foodservice directors are to implement a biosecurity management plan in their operations.

Statement of Purpose

Various government agencies and industries are actively involved in the formation of effective defense mechanisms (Meyerson & Reaser, 2002). However, uncertainty and lack of information about risk will increase fear associated with bioterrorism. Increasing the level of awareness is one of the five major strategies the FDA adopted for counterterrorism (Meadows, 2004). However, no study has investigated foodservice directors' awareness of the bioterrorism attack risks they are facing. As a result, the likely that foodservice directors will develop and implement a voluntary food defense management plan is not known. Even though the FDA tries

to minimize the risk with the registration and detention rule under the Bioterrorism Act, this law does not regulate restaurants and on-site foodservice operations (the Bioterrorism Act of 2002).

Gaps exist in research on concerns about bioterrorism and the level of preparedness in the foodservice industry and how to effectively decrease the risks. Although the government recommends foodservice operations have a food defense plan, the willingness to implement such a plan had not yet been investigated. Because a food defense plan is not mandatory but voluntary, it is extremely important to reveal directors' intention to develop and implement a food defense management plan and to encourage them to follow the recommendations.

For this investigation, the protection motivation theory was used to measure the perceived risk and director implementation intentions. Protection motivation theory enabled the researcher to investigate not only the risk perception related to food terrorism but also the foodservice directors' efficacy perception related to the implementation of a food defense management plan.

Purpose and Objectives

In spite of the urgent need, research on perception of and preparedness against food bioterrorism in foodservice has not been conducted nationwide. The primary purpose of this study was to explore the likelihood that on-site foodservice operations would implement a food defense management plan using the protection motivation theory as the theoretical foundation. The study was designed to address the gap in current knowledge of food bioterrorism in foodservice operation. The specific objectives for this study included:

1. Explore on-site foodservice directors' risk perception associated with a food terrorism attack.
2. Examine on-site foodservice directors' perceived effectiveness of a food defense management plan.
3. Test protection motivation theory in a group / business setting.
4. Ascertain whether the protection motivation forms as a function of the foodservice directors' risk perception.
5. Provide detailed explanation of the food defense management plan.

6. Explore the extent to which healthcare and school foodservice directors had implemented some critical preventive practices

Research Hypotheses

To achieve the objectives of the study, the following hypotheses were established:

Hypothesis 1: Foodservice directors perceive a significant amount of threat of possible bioterrorism attacks.

Hypothesis 2: Foodservice directors with higher protection motivation have higher intention to implement a food defense management plan.

Hypothesis 3: When the foodservice directors perceive food terrorism as a severe risk, they have a higher motivation to implement a food defense management plan.

Hypothesis 4: When the foodservice directors perceive a food terrorism attack as highly possible, they have higher motivation to implement a food defense management plan.

Hypothesis 5: Perceived effectiveness of a food defense management plan positively affects the foodservice director's protection motivation.

Hypothesis 6a: Perception of the director's ability to implement a food defense management plan positively affects the foodservice director's protection motivation.

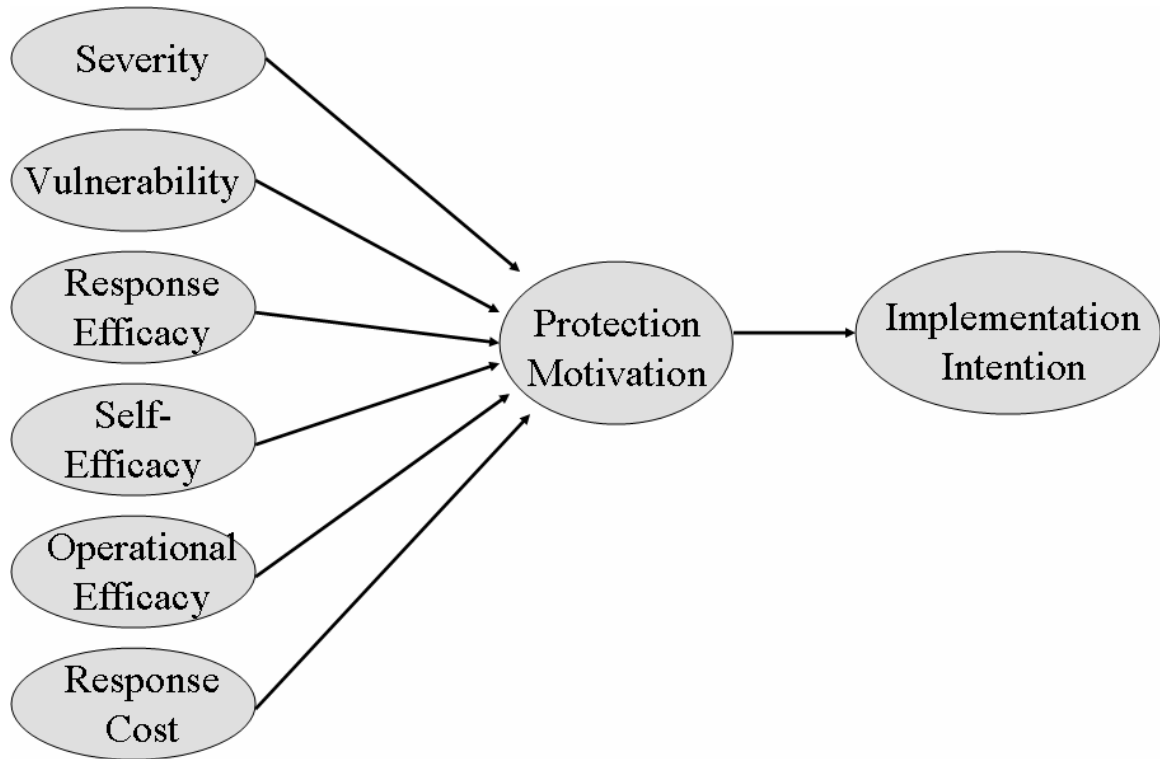
Hypothesis 6b: Perception of the operational ability to implement a food defense management plan positively affects the foodservice director's protection motivation.

Hypothesis 7: Perceived barriers to implementing a food defense management plan negatively affect the foodservice director's protection motivation.

Operationalized Model

A conceptual model was made to test these hypotheses simultaneously.

Figure 1.1 Operationalized Model



Significance of Study

This research is important from both theoretical and operational perspectives. From a theoretical perspective, this research tested the PMT in a group/business setting. PMT has been tested in various situations targeting individual behavioral changes for their own well being (Floyd et al., 2000; Milne et al., 2000). However, it had never been tested in a group or a business setting. In the group setting, the decision maker and the object of protection do not coincide. Unlike the individual setting, the protection motivation evoked by the decision maker would not only affect him or her but also others involved in the group and the business. In the foodservice industry, the objects of protection from bioterrorism attack range from the direct

stakeholders, such as the clients/customers and employees of the operation, to the general public. Therefore, finding an effective way to persuade foodservice directors to implement preventive measures is essential. In other words, it is important to reveal whether or not the fear appeal works in this group setting. If it is effective, identifying the component of the PMT that affects the foodservice directors' decision to follow the recommendation becomes very important.

From a practical perspective, this research investigated how likely foodservice directors are to implement preventive measures for intentional contamination of their food, whether they perceive the risk associated with food terrorism attack, their perception of the effectiveness of the food defense management plan, and whether they think they can implement a food defense management plan in their operation successfully. In addition, this research explored what the government has done to prevent bioterrorism and how well foodservice operations that serve the most vulnerable population in the U.S. are prepared for a possible bioterrorism attack.

Results of the study identified foodservice directors' intentions to implement a food defense management plan, and thus provide information that governmental agencies and professional associations need to identify communication mechanisms and training strategies that would help foodservice directors to adopt food defense management plans. Understanding the decision making mechanism is important because government agencies, policy makers, practitioners, and researchers can develop information for campaigns, flyers, seminars, or trainings to promote implementation intentions. The result of this study will help in developing effective persuasion messages that will motivate foodservice directors to implement a food defense management plan in their operations. In fact some governmental agencies, such as USDA and FDA, have published guidelines for developing and implementing a food defense management plan. However, these agencies have not identified ways to motivate foodservice directors to implement the guidelines. The results of this study provide these agencies insight into how to motivate foodservice directors to access, read, and implement the guidelines.

This study also benefits to the foodservice industry by confronting the foodservice industry with the importance of implementing a food defense management plan. Distribution of the survey packet itself increased that awareness.

Definition of terms

Food Biosecurity: Food biosecurity is the protection of food from bioterrorism (USDA, 2003). In this study, the terms food biosecurity and food defense are used interchangeably.

Bioterrorism: Bioterrorism is “the intentional use of biological and chemical agents for the purpose of causing harm” (USDA, 2003).

Food Bioterrorism (Food Terrorism): “an act of threat of deliberate contamination of food for human consumption with chemical, biological or radionuclear agents for the purpose of causing injury or death to civilian populations and/or disrupting social, economic or political stability” (WHO, 2002).

Food Biosecurity Management Plan (Food Defense Management Plan): A food biosecurity management plan is “a written document that spells out policies and procedures that minimize the risk of intentional contamination of food and reduce the risk of illness or death in community” (USDA, 2003). In this study, food biosecurity management plan and food defense management plan are the same.

Protection Motivation: The protection motivation is an intermediate state between cognitive appraisal of fear and behavior (Rogers, 1983).

Protection Motivation Theory (PMT): The protection motivation theory (PMT) is a fear appeal model to predict and persuade an individual’s behavior. According to PMT, when an individual faces a threat, two cognitive appraisal phases – threat appraisal and coping appraisal – mediate the choice of a coping behavior. In order to persuade individuals to stop or change behavior, or to perform preventive behaviors, both appraisal phases should be high enough to form protection motivation (Rogers, 1983).

Threat Appraisal: Threat appraisal consists of severity perception and vulnerability perception. Threat appraisal is related to perceptions of performing maladaptive behaviors (Rogers, 1983).

Coping Appraisal: Coping appraisal is related to perceptions of performing adaptive behaviors. Coping appraisal involves an individual’s assessment of the effectiveness of the recommended behavior and the individual’s perceived ability to implement the recommended behavior (Rogers, 1983).

Perceived Severity: Perceived severity is how seriously an individual takes a threat (Rogers, 1983).

Perceived Vulnerability (Perceived Susceptibility): Perceived vulnerability is how personally susceptible an individual feels about the communicated threat (Rogers, 1983).

Self-Efficacy: Self-efficacy is the perceived ability of the person to initiate the adaptive response (Rogers, 1983).

Operational Efficacy: Operational efficacy is the ability of an organization to implement the recommended action. In this study, organizational efficacy was measured as the perception of person in charge of the organization.

Response Efficacy: Response efficacy is the belief that the adaptive response will be effective in preventing harm (Rogers, 1983).

Response Cost: Response cost is any cost associated with implementing the adaptive coping response (Rogers, 1983).

References

- Berry, J. D. (2005). Rational monoclonal antibody development to emerging pathogens, biothreat agent and agents of foreign animal disease: The antigen scale. *The Veterinary Journal*, 170(2), 193-211.
- Bledsoe, G. E., & Rasco, B. A. (2002). Addressing the risk of bioterrorism in food production. *Food Technology*, 56(2), 43-44, 46-47.
- Blyn, L. B. (2006). Biosensors and food protection. *Food Technology*, 60(2), 36-41.
- Bruemmer, B. (2003). Food biosecurity. *Journal of American Dietetic Association*, 103(6), 687-691.
- Bryant, C. M., McEntire, J., & Newsome, R. (2005). Defending the food supply. *Food Technology*, 59(8), 64-65, 67, 68, 71, 73.
- Dillman, D.A. (2000). *Mail and Internet Surveys: The Tailored Design Method* (2Ed). New York, NY: John Wiley & Sons, Inc.
- Floyd, D., L., Prentice-Dunn, S., & Rogers, R. W. (2000). A meta-analysis of research on protection motivation theory. *Journal of Applied Social Psychology*, 30, 407-429.
- Hollingworth, P. (2002). Hot topics address terrorism, fickle consumers, and obesity. *Food Technology*, 56(8), 48-50, 52.
- Meadows, M. (2004). The FDA and the fight against terrorism. [Electronic version]. *FDA Consumer Magazine*, 38(1) Retrieved May 25th, 2006,
- Meyerson, L. A., & Reaser, J. K. (2002). Biosecurity: Moving toward a comprehensive approach. *BioScience*, 52(7), 593-600.
- Milne, S. E., Shhran, P., & Orbell, S. (2000). Prediction and intervention in health-related behaviour: A meta-analysis review of protection motivation theory. *Journal of Applied Social Psychology*, 30, 106-143.
- Peregrin, T. (2002). Bioterrorism and food safety: What nutrition professionals need to know to educated the american public. *Journal of American Dietetic Association*, 102(1), 14-16.
- Rogers, R. W. (1983). Cognitive and physiological processes in fear appeals and attitude change: A revised theory of protection motivation. In B. L. Cacioppo & L. L Petty (Eds.), *Social psychophysiology: A sourcebook* (pp. 153-176). London, UK: Guilford.

- Stauffer, J. E. (2002). Crisis management. *Cereal Foods World*, 47(9), 447-448.
- United States Department of Agriculture. (2003). A biosecurity checklist for school foodservice programs – developing a biosecurity management plan. Retrieved September 29, 2004 from <http://schoolmeals.nal.usda.gov/Safety/biosecurity.pdf>
- United States Food and Drug Administration. (2003). The bioterrorism act of 2002. Retrieved September 3, 2004 from <Http://www.fda.gov/oc/bioterrorism/bioact.html>
- White, P. (2002). Food security. *School Foodservice and Nutrition*, 56(8), 42-46.
- World Health Organization. (2002). Terrorist threats to food: Guidance for establishing and strengthening prevention and response systems. Retrieved August 4, 2004 from http://www.who.int/foodsafety/publications/fs_management/terrorism/en/
- Yoon, E. & Shanklin, C.W. (2007b). Implementation of food biosecurity management plan against food terrorism in on-site foodservice operations. *Journal of Hospitality and Tourism Research*, 31(2), 224-240.

CHAPTER 2 - Review of Literature

Terrorism, Bioterrorism and Food Bioterrorism

In the Code of Federal Regulations (28 C.F.R. Section 0.85), terrorism is defined as “the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population or any segment thereof, in furtherance of political or social objectives.” The Federal Bureau of Investigation (FBI) categorizes terrorism as one of two types – domestic terrorism or international terrorism. Domestic terrorism involves groups or individuals whose terrorist activities are directed at elements of the U.S. government or population without foreign direction. International terrorism involves groups or individuals whose terrorist activities are foreign-based and directed by countries or groups outside the U.S. or whose activities exceed national boundaries (FEMA, 2005).

While it is not possible to confirm when it had started, the roots of terrorism can be traced back at least 2,000 years. According to the Center for Defense Information (CDI), in early history, religion was the major reason for terrorist activities. The term ‘terrorism’ is derived from regime de la terreur, which meant to support the newly installed revolutionary government. The French revolutionary leaders viewed it as vital for the new French Republic to survive its infancy. Around 40,000 people were executed using this justification. English writers changed the use of the term, and terrorism became a negative concept. CDI reported that terrorism by anarchists began in America in the 1880s (CDI, 2003).

Approximately 20,000 terrorism events and 7,400 adverse events, both involving more than one victim, were recorded worldwide from 1968 to 2004 (Bogen & Jones, 2006). Among the 87,000 injuries, 25,400 were fatal. Even though the Sept. 11, 2001 incidents skewed this trend significantly, an upward trend was detected for number of events, injuries, and deaths in the Bogen and Jones study. The projection model developed by Bogen and Jones (2006) anticipates that these numbers will continue to increase.

Bombings have been the most frequently used terrorist method (FEMA 2005; McGlown 2004). The Federal Emergency Management Agency (FEMA) noted that the U. S. has been more cautious about terrorist attacks involving biological or chemical agents since the anthrax cases in 2001. Some of these agents can have an immediate effect and are odorless and tasteless. Because

some of these agents are difficult to detect with current technologies, the possibility of terrorists developing and using biological or chemical agents to contaminate the food or water supply system is very high (Hall et al., 2004; FEMA, 2005).

Since 2001, international organizations, as well as the U.S. agencies, have dramatically increased their efforts to deal with bioterrorism by defining it and enlightening the public. According to the USDA, bioterrorism is “the intentional use of biological and chemical agents for the purpose of causing harm” (USDA, 2003). Bioterrorism is not limited to the U.S.; it is a global issue. Foods are traded globally, so bioterrorism agents can easily spread throughout the world. Under these circumstances, international cooperation is required to build an effective system to fight bioterrorism (World Health Organization [WHO], 2002). WHO defines food terrorism as “an act of threat of deliberate contamination of food for human consumption with chemical, biological or radionuclear agents for the purpose of causing injury or death to civilian populations and/or disrupting social, economic or political stability” (WHO, 2002). Based on this definition, terrorism does not have to be related to any political or religious pursuits or enemies from outside of the nation. Food terrorism or food bioterrorism, as used hereafter in this study, means the malicious intentional contamination or adulteration of food with these biological or chemical agents.

Categorization of Bioterrorism Agents

The Centers for Disease Control (CDC) categorized bioterrorism agents and diseases into three levels based on their severity and ease of dissemination or transmission. Specific information related to these three categories is presented in Table 1. Botulinum, which is closely related to food products, is one of the critical biological agents that the CDC gives the highest priority (CDC, n.d.). Threats related to food and water safety are the CDC’s second highest priority because contaminating agents can easily be disseminated, and the morbidity and mortality of pathogens related to these threats are moderate to low (CDC, n.d.). The mortality associated with a bioterrorism attack for agents in this category may not be as severe as others like anthrax. However, a bioterrorism attack through the food supply system would have a tremendous adverse economic and social impact. Moreover, the possibility of bioterrorists using food as the source of an attack is higher than threats specified in the first tier because its ease of dissemination (Bledsoe & Rasco, 2002).

Consequences of Terrorist Attack

Bruemmer (2003) identified the consequences of a compromised food supply in four different areas: physical, psychological, political, and economic. Besides an insufficient food supply (physical), morbidity and mortality caused by a bioterrorism attack would lead to psychological consequences, such as discomfort and fear (Bruemmer, 2003; Hall et al., 2004). Disorders such as depression, generalized anxiety, and panic may develop among direct victims and lead to increased consumption of alcohol, nicotine, and other substances. Family conflict and domestic violence may also rise (Hall et al., 2004). In the broader scope, most people in society will experience some degree of psychological distress following a disaster or terrorism event. Their responses can include decreased confidence in their safety, less travel, concentration disruption, sadness, and anger. According to Krueger and Maleckova (2002), the definitions of terrorism used in academia place more emphasis on the intention of terrorists to cause fear and terror among a targeted population than is experienced by the direct victims of the terrorist attack. The direct victim of the terrorism is thus not the main target of the terrorism act. Following a terrorism act, the public's confidence in government's ability to protect them would decrease significantly.

Estimation of Economic Impact of Food Terrorism

Economic impact is another very significant effect of a terrorism attack (Bruemmer, 2003; Hall et al., 2004). The magnitude of the economic impact can be easily estimated from the previous foodborne illness outbreaks. Foodborne disease is extremely costly. According to the National Institutes of Health (NIH), the annual cost of all foodborne diseases in the United States is \$5 to \$6 billion in direct medical expenses and lost productivity (NIH, 2005). USDA's Economic Research Service estimated the annual expenditures for illnesses caused by five pathogens: *Campylobacter* (all serotypes), *Salmonella* (nontyphoidal), *E. coli* O157, *E. coli* non-O157 STEC, and *Listeria monocytogenes*. The two most costly foodborne illness pathogens are *Salmonella* and *Listeria monocytogenes*. Based on updated data from Economic Research Service (2004), the cost of *Salmonella* account for an estimated \$3 billion. Beside the monetary losses from illness, the level of consumer trust in the food industry, as a whole, decreases after significant foodborne illness outbreaks.

Table 2.1 Bioterrorism Agents and Disease Categorization by Centers for Disease Control and Prevention

Category A	Category B	Category C
<p>The U.S. public health system and primary healthcare providers must be prepared to address various biological agents, including pathogens that are rarely seen in the United States. High-priority agents include organisms that pose a risk to national security because they</p> <ul style="list-style-type: none"> ✓ can be easily disseminated or transmitted from person to person; ✓ result in high mortality rates and have the potential for major public health impact; ✓ might cause public panic and social disruption; ✓ require special action for public health preparedness 	<p>Second highest priority agents include those that</p> <ul style="list-style-type: none"> ✓ are moderately easy to disseminate; ✓ result in moderate morbidity rates and low mortality; and ✓ require specific enhancements of CDC's diagnostic capacity and enhanced disease surveillance 	<p>Third highest priority agents include emerging pathogens that could be engineered for mass dissemination on the future because of</p> <ul style="list-style-type: none"> ✓ availability; ✓ ease of production and dissemination; and ✓ potential for high morbidity and mortality rates and major health impact
<p><u>Agents/Diseases</u></p> <ul style="list-style-type: none"> • Anthrax (Bacillus anthracis) • Botulism (Clostridium botulinum toxin) • Plague (Yersinia pestis) • Smallpox (variola major) • Tularemia (Francisella tularensis) • Viral hemorrhagic fevers (filoviruses [e.g., Ebola, Marburg] and arenaviruses [e.g., Lassa, Machupo]) 	<p><u>Agents/Diseases</u></p> <ul style="list-style-type: none"> • Brucellosis (Brucella Species) • Epsilon toxin of Clostridium perfringens • Food safety threats (e.g., Salmonella species, Escherichia coli O157:H7, Shigella) • Glanders (Burkholderia Mallei) • Melioidosis (Burkholderia pseudomallei) • Psittacosis (Chlamydia psittaci) • Q fever (Coxiella burnetii) • Ricin toxin from Ricinus communis (castor beans) • Staphylococcal enterotoxin B • Typhus fever (Rickettsia prowazekii) • Viral encephalitis (alphaviruses) • Water safety threats (e.g. Vibrio cholerae, Cryptosporidium parvum) 	<p><u>Agents/Diseases</u></p> <ul style="list-style-type: none"> • Emerging infectious diseases such as Nipah virus and hantavirus

Note: Content of this table was directly quoted from <http://www.bt.cdc.gov/agent/agentlist-category.asp>. Only the format has been changed to tabular format.

Roles of Government Agencies

Several governmental agencies are involved in combating bioterrorism threats. According to the U.S. Department of Health and Human Services (HHS) 2006 fiscal year plan, the FDA, the Health Resources and Services Administration, and the CDC have initiated specific action plans for effective response to terrorism and other public challenges. The FDA is responsible for providing regulatory review of medical products, inspecting domestic food manufacturers, and enhancing food import inspections to protect nation's food supply and prevent food borne illness (HHS, 2005). The FDA is also responsible for regulating the safety of 80% of the U.S. food supply (HHS, 2005). The Health Resources and Services Administration is responsible for preparing hospitals and other medical facilities for health consequences of bioterrorism and other mass casualty events (HHS, 2005). The CDC has an integral role in strengthening state and local public health infrastructure to effectively respond to emergencies (HHS, 2005).

Among these agencies, the FDA is directly involved with the retail and institutional foodservice industry. The FDA has committed significant effort and resources to identifying strategies to protect the food supply from terrorist attacks. These efforts and resources are used to defend food supply before terrorist event occurs. Under the Bioterrorism Act of 2002, the FDA requires both domestic and international facilities providing food to the public to be registered. The Bioterrorism Act of 2002 describes these facilities as "any facility engaged in manufacturing, processing, packing, or holding food for consumption in the United States." Both domestic and foreign facilities that export food to United States are required to submit a registration accompanying the importer's registration. However, restaurants, farms, and other retail food establishments are not currently included in the Act's definition of 'facility' (the Bioterrorism Act of 2002; Federal Register, 2003). Besides registration, the FDA can detain and diagnose any suspicious food. According to the final rule announced in May 2004, the FDA detains food articles that may pose a threat of serious health problems. The length of detention varies and can last up to 30 days depending on the strength of credible evidence or the diagnosis (FDA Consumer Report, 2004).

FDA initiated ALERT to raise the awareness regarding food defense issues among the state and local government agency and industry representatives (FDA, 2006). ALERT is an

acronyms of Assure, Look, Employees, Reports, and Threat. FDA suggested that the industries and businesses use these five key points to decrease the risk of intentional food contamination at their facilities. FDA is providing ALERT brochures and wallet cards in five different languages: English, Chinese, Korean, Spanish, and Vietnamese, and posters in two different languages: English and Spanish along with a web-based ALERT training. These ALERT materials explain how to (1) assure that the supplies and ingredients are from safe and secure source; (2) look after the security of the products and ingredients; (3) get to know employees and people coming in and out of the facility; (4) prepare reports about security of products while under the control; (5) respond to a threat or a suspicious behavior (FDA, 2006).

Another food defense activity that FDA is highly involved in is called CARVER + Shock (FDA, June 14, 2007). The Strategic Partnership Program Agroterrorism (SPPA) Initiative is a joint effort of the Department of Homeland Security (DHS), FBI, USDA and FDA to help secure the nation's food supply. Through the SPPA Initiative, CARVER + shock was developed and modified based on the series of site visits since 2005. CARVER + Shock is a vulnerability assessment tool adapted from the military version of CARVER for use in the food industry. Conducting traditional CARVER + Shock assessment involves several different government agencies; FDA, USDA, FBI, local or/and state agencies, etc. FDA has developed and distributed the software that enables the user to identify where an attack is most likely to occur and, therefore, to focus resources on protecting the most susceptible points in their system. CARVER is an acronym for Criticality (measure of public health and economic impacts of an attack), Accessibility (ability to physically access and egress from target), Recuperability (ability of system to recover from an attack), Vulnerability (ease of direct loss from an attack as measured by loss in production), Effect (amount of direct loss from an attack as measured by loss in production), and Recognizability (ease of identifying target) which are used to evaluate the attractiveness of a target for attack while Shock assesses the combined health, economic and psychological impacts of an attack within the food industry. Besides, these two major activities, FDA is also providing several food defense related training videos and other materials on its websites.

USDA also put its effort on food terrorism and defense issues by publishing several different guidelines targeting different audiences; Food Safety and Inspection Service (FSIS) Security Guideline for Food Processors (<http://www.fsis.usda.gov/PDF/Securityguide.pdf>), FSIS

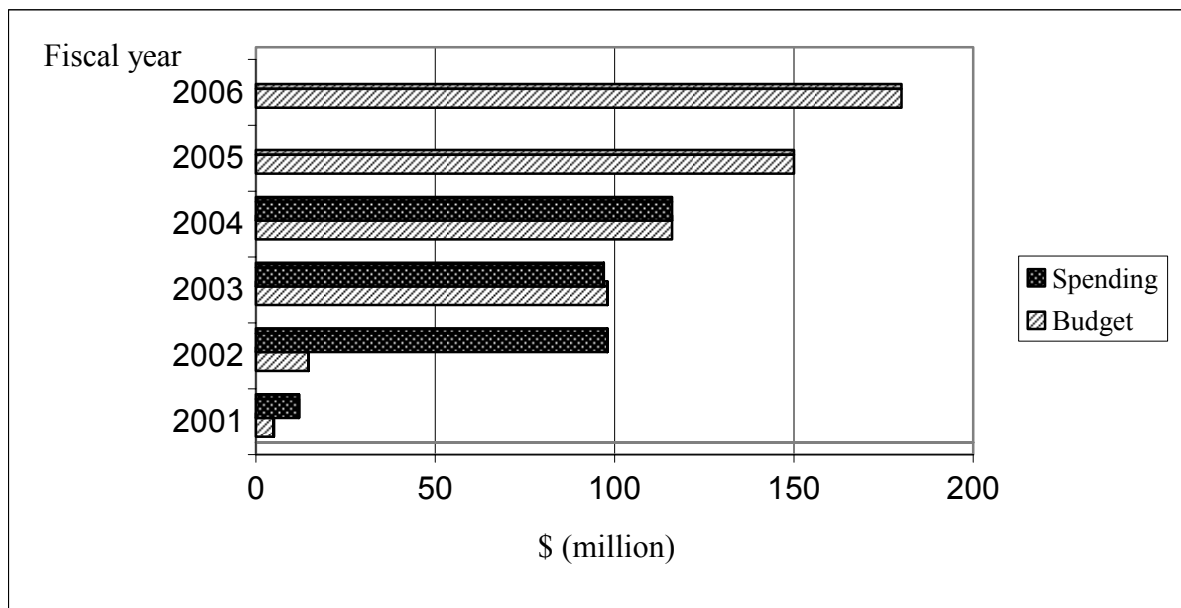
Security Guideline Keep America's Food Safe

(http://www.fsis.usda.gov/PDF/Keep_Americas_Food_Safe.pdf), FSIS Safety and Security Guidelines for the Transportation and Distribution of Meat, Poultry, and egg Products

(<http://www.fsis.usda.gov/OA/topics/transportguide.pdf>). The Food and Nutrition Service of the USDA also published a biosecurity checklist guideline for school foodservice programs (<http://healthymeals.nal.usda.gov/hsmrs/biosecurity.pdf>) to help school foodservice directors strengthen the safety and security of their operations to protect not only children but also adults in the system (USDA, 2003). While these guidelines are not mandatory, the Food and Nutrition Service strongly recommends that the school community develop a biosecurity management plan. Other than this checklist for school foodservice, some resources are available for retail and institution foodservice managers who plan to develop and implement a management plan (e.g., White, 2002; Gerald & Perkin, 2003; Center for Food Safety and Applied Nutrition, 2003).

The importance the U.S. has placed on securing the food supply is evident in the federal budgets of the FDA and other agencies. Figure 2-1 illustrates the increase in the expenditures of the FDA from fiscal 2001 to 2006. FDA received \$5 million of the \$12 million requested for bioterrorism for fiscal year (FY) 2001. For the FY 2002, \$14.7 million was originally budgeted for food defense under the presidential initiatives. However, the FDA spent \$98 million to address bioterrorism in 2002. For FY 2006, the FDA's budget for food defense is \$180 million, a \$30 million increase from FY 2005 (HHS). The budget the CDC requested for FY 2006 total for Terrorism Preparedness and Emergency Response program is \$1,616.7 million (HHS, 2005).

Figure 2.1 FDA Budgets and Spending for Food Defense



While the FDA is responsible for regulating the food supply, the Health Resources and Services Administration Bioterrorism Hospital Preparedness Program is designed to enable state and regional planning among local hospitals, emergency medical services systems, health centers, poison control centers, and other health care facilities to improve their ability to work together to combat terrorist attacks and manage infectious disease epidemics and other public health emergencies (HHS, 2005). The Health Resources and Services Administration works to ensure that 100% of the Bioterrorism Hospital Preparedness Program awardees, including all 50 states, develop regional customized plans that can effectively respond to a bioterrorism attack so that these hospitals can immediately take care of a large number of people requiring medical care (HHS, 2005).

Roles and responsibilities of dietitians and other foodservice professionals

Identifying ways to improve access to a safe and secure food supply is one of the nine priority research areas of the American Dietetic Association (ADA). In the “Position of the American Dietetic Association: Food and Water Supply,” updated in September 2003, including bioterrorism reveals its importance to the Association (Gerald & Perkin, 2003). In addition, the ADA House of Delegates distributed a background paper to their members to increase awareness

of a safe food and water supply (ADA, 2006a). In this background paper, ADA explained who is involved, the current status, what has been done, and how ADA is dealing with this issue. The House of Delegates later prepared a list of suggested actions for the ADA members, affiliates, and registered dietitian/dietetic technicians for food and water safety (ADA, 2006b). One recommendation was for dietetic professionals to develop consumer materials. Peregrin (2002) and Bruemmer (2003) emphasized the role of dietitians in monitoring any abnormal or unusual health behaviors among consumers and educating the public about the bioterrorism and food safety.

According to a report from the Nation's Restaurant News, restaurants and movie theaters in the United States could be targets of al-Qaeda (Prewitt, 2005). In this report, many foodservice executives and officials agreed that food safety and security are closely related. However, the restaurant industry is skeptical about regulation under the 2002 Bioterrorism Act, mainly because of cost and complexity. The National Restaurant Association (Kim, 2003), while agreeing on the needs and intents stated in the Bioterrorism Act of 2002, expressed concerns that FDA regulation, especially related to the imported food, is unrealistic given the characteristics of restaurant business. The Grocery Manufacturers of America (GMA) voiced even stronger objections in the Food & Drink Weekly (July 21, 2003). In comments to the FDA, GMA says tracking lot numbers from manufacturer to distributor to specific retailer is a key area of concern for the food industry. GMA also says the FDA proposal goes beyond its authority "to require the maintenance of limited distribution records" as established by the Bioterrorism Act of 2002. GMA stated that the information required by the FDA would not facilitate efforts to remove potentially contaminated products from the marketplace.

School foodservice directors have been advised to pay more attention to biosecurity issues because they serve a high risk population. White (2002) stressed recognizing the difference between food safety and food biosecurity, the importance of having credible vendors, and the preparedness of school foodservice professionals. The Food and Nutrition Service of the USDA recently published a biosecurity checklist guideline for school foodservice programs to help school foodservice directors strengthen the safety and security of their operations to protect not only children but also adults in the system (USDA, 2003). While these guidelines are not mandatory, the Food and Nutrition Service strongly recommends that the school community develop a biosecurity management plan. Other than this checklist for school foodservice, some

resources are available for retail and institution foodservice managers who plan to develop and implement a management plan (e.g., White, 2002; Gerald & Perkin, 2003; Center for Food Safety and Applied Nutrition, 2003).

Organizations affiliated with the food industry have also developed guidelines for internal and external use. The American Institute of Baking (AIB) International published “The AIB International Guide To Food Defense For Food Retail and Food Service Operations” in 2006. This non-profit corporation, founded by the North American wholesale and retail baking industries, published the guideline to train their students and others who are interested in the food defense issues. AIB International also provide off-line and on-line seminars to food industry professionals. The guidelines explain the food defense program, why it is important, what security measures are needed, and how to develop and implement a food defense program. In the guidebook, food terrorism threats can be divided into two categories: internal and external. Attackers are categorized into five types: criminals, protesters, terrorists, subversives, and rogue or disgruntled insiders. Internal threat is related to employees and vendors who have access to the facility while external threat refers to threats caused by outside attackers who do not have facility access. Even though internal threats are more common, external threats should not be neglected because different approaches are needed to prevent attacks.

Research on bioterrorism and preparing for attacks in the foodservice industry is still incomplete. Yoon and Shanklin (in press) conducted a pilot study that investigated foodservice operation’s level of preparation for food terrorism. They explored the level of preparedness against food terrorism attack in on-site foodservice operations in Kansas. The results of the study showed that practices related to chemical use and storage and food handling were most frequently implemented while securing the facility and communicating with local authorities and suppliers were least frequently implemented. The results also show that when respondents perceived items to be more important, they were practiced more frequently. The foodservice directors in healthcare facilities perceived all practice categories as important and practiced them more frequently than school foodservice directors. Assigning a person to be responsible for biosecurity practices and to attend seminars on food biosecurity significantly increased the frequency of biosecurity practices. In Yoon and Shanklin’s study, food biosecurity preventive measures appear to be related to the perceptions of foodservice directors. Yoon and Shanklin proposed that the use of material safety data sheets might guide foodservice operations to

perform preventive measure automatically. If this is true, a well-prepared and detailed food defense management plan should work effectively because this management plan is “a written document that spells out policies and procedures that minimize the risk of intentional contamination of food and reduce the risk of illness or death” (USDA, 2003, p1).

In addition, consumer perception about the risk associated with food supply in the U.S. was investigated by Spillman (2003). The Spillman’s study found that older individuals with less education and middle-aged adults with post-baccalaureate education perceived more risks of a bioterrorism attack in the food supply system in the United States. Most responded that ‘contamination by poison’, ‘microorganisms’, or ‘water polluted by nuclear waste’ could be the most significant threat to the food supply.

The results of the Yoon and Shanklin’s study (2006, In Press) and Spillman’s study (2003) provide an important starting point to improve biosecurity in the foodservice industry. Foodservice directors need to take a more active role in securing the food supply. Implementing a food biosecurity management plan in an operation will be costly and time consuming; however, doing so is essential if operations are to protect customers and clients. Even though bioterrorism attacks are rare in the foodservice industry, foodservice operations should be prepared for such threats. Like HACCP, biosecurity management plans should be preventive and proactive rather than reactive.

In order to encourage foodservice operations to implement a food defense management plan, an effective communication strategy is critical. Many disease prevention or healthy lifestyle promotions use fear appeals. Fear appeals are very useful, especially when the message receivers perceive the probability that the event will occur is high and the consequences are severe. However, frustrated message receivers may try to reduce the fear aroused by discrediting or ignoring the threatening information if no effective solution follows. One popular theory on health promotion campaigns is the protection motivation theory. The following section will explain the protection motivation theory.

Theories related to fear appeal and behavior change

Health behavior theories try to explain at behavioral change, in particular examining the mechanisms that either shape an intention to change behavior or help to maintain a specific health behavior. Several models have been designed to explain and to predict a behavioral

intention. Different models have been established to better explain why people fail to maintain the health behaviors to which they had committed themselves. Among these models, behavioral models using the effect of fear on persuasion have served as the theoretical framework since 1967.

Janis (1967) developed the first systematic theory of fear and persuasion by adopting and extending the fear-as-acquired-drive model. According to this model, if a persuasive communication arouses fear, people are motivated to reduce this unpleasant drive state. Attitudes are changed when they reduce this state of arousal. Janis proposed that fear arousal has both facilitating and interfering effects. Because of these two contrasting effects, persuasion is an inverted U shaped function of the level of fear arousal. The optimal level of fear arousal is the point where interfering effects match facilitating effects. In other words, moderate fear appeals are more effective in persuading people than weak or strong fear appeals because weak appeals create too little drive and strong appeals create too much tension or drive. In the drive theory, weak fear appeal is better than strong fear appeal because strong fear appeal will lead people to avoid the message. Unfortunately, this theory was not validated because of mixed findings (Higbee, 1969) and the lack of empirical evidence (Rogers 1983).

Several researchers have tried to explain why it did not work (Beck & Frankel, 1981; Leventhal 1970; Hendrick, Giesen, & Borden, 1975; Rogers, 1983). First of all, variables such as efficacy of recommendations, which should interact with fear arousal, did not interact as predicted by drive theory (Beck & Frankel, 1981; Leventhal 1970; Rogers, 1983). That is, in the drive theory, the high fear arousal forms a defensive avoidance reaction, meaning that high threat is less persuasive than low threat. However, some of the early fear appeal studies showed mixed findings on the relationship between level of fear aroused and effectiveness of persuasion (Higbee, 1969). Higbee explored approximately 30 fear appeal studies published between 1953 and 1962, finding that some of studies indicated a negative relationship between fear level and persuasion, others had no relationship, and still others produced mixed findings. Leventhal (1970) also found inconsistent results on the relationship posed in the drive model. He summarized the results of fear appeal studies, noting that the number of studies with a positive relationship between the level of fear and persuasion effectiveness is much higher than those with a negative relationship. Leventhal analyzed the correlation between the level of fear arousal and the effectiveness perception of the recommendations and concluded that elevated fear led to

a favorable evaluation of the persuasive message. However, according to the drive model, the perceived effectiveness of the recommended is not considered because the individuals are coping with their reaction to the event rather than to the message on how to respond to the threatening event. Thus, responses to messages are difficult to determine since the individuals are likely to discredit the message.

Second, in studies manipulating false physiological feedback of fear arousal, arousal produced attitude change although the drive theory requires arousal reduction to change the attitude (Hendrick, Giesen, & Borden, 1975; Rogers, 1983). Lastly, some of the experiments never found any direct relationship between emotional responses (drive) and attitude change (Beck & Frankel, 1981).

Rejection of the drive model led Leventhal to develop another theory dealing with fear and behavior. Leventhal (1970) proposed a parallel response model that distinguished between emotional reactions to threat and attempts to cope with the threat. According to Leventhal, a fear appeal may initiate a danger control process, which attempts to avoid the threatened danger, or a fear control process, which functions to reduce fear. These two processes are parallel or independent. Attempts to control fear do not necessarily produce adaptive behavior. Instead, adaptive behavior results primarily from the danger control process. Therefore, in the parallel response theory, fear appeals may arouse the emotion of fear, but protective action results from the attempt to control the danger, not from attempts to control the fear. The parallel model differentiates emotional response from cognitive responses to fear-arousing communications (Rogers, 1983).

Protection Motivation Theory

The protection motivation theory (PMT) was first developed by Rogers (1975, 1983) to explain the relationship between feeling fear and health behavior change. According to PMT, when an individual faces a threat, the four major cognitive appraisal processes mediate the choice of a coping behavior. These four processes appraise the information available about the perceived severity of the threat, the perceived probability that the threat will occur, the perceived ability of a coping behavior to remove the threat, and the individual's perceived ability to carry out the coping behavior (self-efficacy). The outcome of these appraisal processes is an intermediate state called "protection motivation" (Rogers, 1983). These four processes can be

divided into two different appraisal phases: threat appraisal for the first two and coping appraisal for the other two (Figure 2-2).

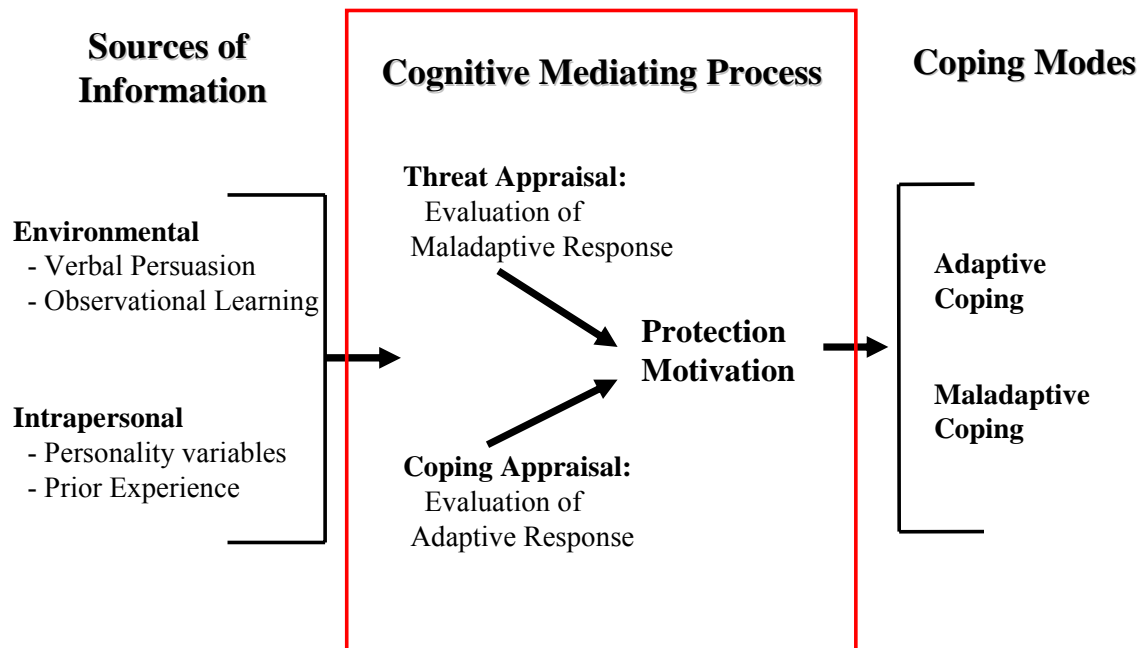
As seen in the Figure 2-2, threat is appraised by evaluating the maladaptive response. Besides the severity and vulnerability perceptions, which decrease maladaptive coping, threat appraisal has a rewards component, which facilitates maladaptive coping. These rewards can be divided into intrinsic and extrinsic rewards. For example, a campaign promotes smoking cessation to decrease the possibility of suffering lung cancer in the future. However, some of the message recipients will continue to smoke when intrinsic (e.g., getting rid of stress, pleasure of inhaling, etc.) and extrinsic (e.g., peer approval, tough looking, etc.) rewards are higher than the fear aroused by the message from the campaign.

The second process, coping appraisal, is associated with proposed health recommendations. It involves the individual's assessment of the effectiveness of the proposed adaptive behavior to avoid the danger, as well as the perceived ability to carry out the recommended actions. High levels of the efficacy variables lead to more likelihood of enacting the adaptive behavior. Perceptions of high response costs in choosing the adaptive behavior decrease this likelihood. In addition to the original two coping appraisal components, any potential costs incurred while performing the recommended behavior also affect its perception. Milne et al. (2000) and Floyd et al. (2000) found that response cost is one of the strongest predictors of protection motivation. Among the coping appraisal components, individual protection motivation is increased by strong self-efficacy and strong response efficacy and decreased by high response cost.

However, the rewards component in the threat appraisal process are seldom included in the empirical PMT studies. Milne and his colleagues (2000) found only one study in which the rewards variable was used. Abraham, Sheeran, Abrams, and Spears (1994) found that rewards (teenagers' 'reputational concern' with using condoms) significantly affected the maladaptive response - message avoidance/denial. Although these authors found that rewards are an important variable in PMT, they also stated that "the conceptual distinction between the reward value of a risk behavior (e.g. the pleasure of unprotected sexual intercourse) and the cost of preventive measures (e.g. anticipated pleasure loss due to condom use) may not be clear in relation to particular precautions" (Abraham, Sheeran, Abrams, & Spears, 1994, p 257)." In fact, no specific reward for not protecting foodservice operations from a possible food bioterrorism

attack is identified. However, the response cost may be an inhibiting factor for implementing a food defense management plan. In this study, therefore, rewards were not be used in the threat appraisal process, but response cost in the coping appraisal process will be included to take the place of the reward.

Figure 2.2 PMT (Modified from Rogers, 1983)



The protection motivation theory (Rogers, 1975, 1983) provides an important social cognitive account of protective behavior. Since Rogers first developed the theory, many studies have applied the model to predict and understand protective behaviors, particularly health-related behaviors. Other social cognition models have also been applied to understand and predict health behavior, including the health belief model (HBM), the theory of reasoned action (TRA), and the subjective expected utility (SEU) theory (Weinstein, 1993). These theories share the idea that motivation for protection results from a perceived threat and the desire to avoid the potential negative outcome. The theories also share a cost-benefit analysis component in which the individual weighs the costs of taking precautions against the expected benefits of taking action.

Advantages of using PMT over other theories

The specific key factors incorporated in the risk and nonrisk variables of each model differ. For example, the response efficacy of taking the precautionary action is an important variable in the PMT and the health belief model but not in the theory of reasoned action and the subjective expected utility theory. The individual's assessment of response efficacy (or the perceived effectiveness) cannot be determined directly in the theory of reasoned action and subjective expected utility theory. A primary difference between the health belief model and PMT is the way in which the two are organized (Prentice-Dunn & Rogers, 1986). The health belief model is organized as a catalog of variables contributing to behavior. PMT is organized along two processes that attempt to match the cognitive processes that people use in evaluating threats (the threat-appraisal process) and in selecting among coping alternatives (the coping-appraisal process). PMT is the only one of the four models, which has the self-efficacy as a separate component (Weinstein, 1993).

Self-efficacy affects the intention to change risk behavior, the effort expended to attain this goal, and the persistence in continuing in spite of barriers and setbacks that may undermine motivation (Bandura, 1991). Self-efficacy has become a widely applied theoretical construct in models of addiction and relapse (e.g., Annis & Davis, 1988; Baer & Lichtenstein, 1988; Donovan & Marlett, 1988; Marlett & Gordon, 1985). Both response efficacy and self-efficacy play an important role in adopting health behaviors, in changing detrimental habits, and in maintaining change (Bandura, 1991). Schwarzer (1992) noted that when adopting a desired behavior, individuals first form an intention and then attempt to execute the action. Outcome expectancies (response efficacy) are particularly important in intention formation but less so in action control. Self-efficacy, on the other hand, seems to be crucial in both stages. In fact, there is evidence that self-efficacy is a powerful determinant of behavioral intentions as well as of actual health behavior. Bandura (1977, 1986, 1988, 1991) found that behavior change is mediated through changes in the belief that one can perform a certain action to attain a desired outcome. Self-efficacy predicts intentions and actions in different domains of human functioning. In the health domain, self-efficacy is a powerful resource in coping with stress (Lazarus & Folkman, 1987). Subjects with high self-efficacy tolerate more pain than those with low self-efficacy (Litt, 1988; Manning & Wright, 1983). Self-efficacy affects blood pressure, heart rate, and serum catecholamine levels in challenging or threatening situations (Bandura,

Cioffi, Taylor, & Brouillard, 1988; Bandura, Reese, & Adams, 1982; Bandura, Taylor, Williams, Mefford, & Barchas, 1985). In the field of weight control and eating behavior, various studies have used self-efficacy measures (Bernier & Avard, 1986; Chambliss & Murray, 1979; Glynn & Ruderman, 1986; Slater, 1989; Weinberg, Hughes, Critelli, England, & Jackson, 1984). Compliance with medical regimens improved after patients suffering from chronic obstructive pulmonary diseases received self-efficacy training (Kaplan, Atkins, & Reinsch, 1984). The role of self-efficacy in initiating and maintaining a regular program of physical exercise has been studied by Wurtele and Maddux (1987). A meta-analysis concluded that the association between self-efficacy and intention was the most robust of all associations between PMT variables and intention (Milne et al., 2000).

Studies Using PMT

PMT has been applied to a number of threats, most being health-related threats, where the model has been used to understand and predict protective health behavior. These health-related threats have included AIDS, alcohol abuse, breast self-examination, cancer, muscular dystrophy, osteoporosis, and exercise. Floyd et al. (2000) also conducted a meta-analysis, identifying 65 studies that used PMT to explore health-related threats. The studies included cancer prevention (11 studies), exercise/diet/healthy life style (11 studies), smoking (6 studies), AIDS prevention (6 studies), alcohol consumption (5 studies), and adherence to medical-treatment regimens (4 studies).

Beyond health-related issues, PMT has been used to explore injury prevention, political issues, environmental concerns, and protecting others (Floyd et al., 2000). Protective behaviors to which PMT has been applied and that were included in the meta-analysis studies of Floyd et al. (2000) and Milne et al. (2000) included preventing of nuclear war (Axlerod & Newton, 1991; Wolf, Gregory, & Stephen, 1986), increasing earthquake preparedness (Mulilis & Lippa, 1990), conserving water (Kantola, Syme, & Nesdale, 1983), driving safely (Griffeth & Rogers, 1976), protecting children (Campis, Prentice-Dunn, & Lyman 1989), improving dental hygiene (Beck & Lund, 1981), ensuring food safety (Schafer, Schafer, Bultena, & Hoiberg, 1993), preventing osteoporosis (Smith-Klohn & Rogers, 1991), using marijuana (Epstein, Bovine, Diaz, & Toth, 1995), seeking emergency help via 911 (Meischke, Eisenberg, Shaeffer, Larsen & Henwood, 1994), and managing pain during recovery after dental surgery (Gidron, McGrath, & Goodday,

1995). According to these meta-analysis results, PMT is a practical model to use in intervention. Variables in the PMT studies included in the meta-analysis had statistically significant effect sizes. This indicates that the PMT model can reveal why attitudes and behaviors can change when people feel threatened. Coping appraisal affects the attitude or behavior more strongly than threat appraisal (Floyd et al., 2000; Milne et al., 2000).

Thus, the PMT concept involves any threat for which there is an effective recommended response that can be implemented by the individual. However, no study testing PMT at the business or operation level was found. One unique contribution of this study, therefore, is the exploration of whether PMT works in a business setting. Slight modification may be necessary to address the characteristics of the study subject, which is a group, not an individual.

Three expected outcomes of the fear appeal communication

The evaluation of a fear appeal initiates two appraisals of the message. This appraisal results in one of two outcomes: adaptive coping and maladaptive coping. However, in some other fear appeal studies, such as the fear-as-acquired-drive model and the extended parallel process model, the outcomes were divided into three categories: message ignorance, fear control response, and danger control response (Witte, 1992; Witte et al., 1998). PMT does not differentiate message ignorance and danger control response. Rather, message ignorance is treated as a part of maladaptive coping (fear control). Witte proposed the extended parallel process model be used to explain when and why fear appeals work and when and why they do not work (Witte, 1992). When people receive a message, individuals appraise the threat of hazard first. The more individuals believe themselves to be susceptible to a serious threat, the more motivated they are to begin the second appraisal, which is an evaluation of the efficacy of the recommended response. If the threat is perceived as irrelevant or insignificant, then there is no motivation to process the message further, and people simply ignore the fear appeal (Witte. et al, 1998). When people perceive a serious and relevant threat, they become scared. Their fear motivates them to take any action that will reduce their fear. Beliefs about the effectiveness of the recommended response and beliefs about one's ability to perform the recommended response determine whether people are motivated to control the danger of the threat or to control their fear of the threat. People engage in danger control processes when they believe they are easily, feasibly, and effectively able to avert a serious and relevant threat from occurring by adopting

the recommended response. Thus, high perceived efficacy accompanied with high perceived threat initiate danger control responses such as attitude, intention, and behavior change. This danger control response is called protection motivation in PMT.

In contrast, people engage in fear control processes when they do not think they can adopt a recommended response because (a) it is perceived as too difficult, too costly, too time consuming (low self-efficacy) or (b) they think it will not effectively avert the threat (low response efficacy). When fear control processes occur, people give up on trying to control the danger and, instead, turn to controlling their fear. Thus, low perceived efficacy coupled with high perceived threat promote fear control responses such as denial, defensive avoidance, or reactance, which result in rejecting of the message's recommendations. It is important to note that if no information is given about the efficacy of the recommended response in the message, individuals will rely on past experiences and prior beliefs to determine perceived efficacy levels (Witte et al., 1998).

Table 2.2 Outcomes of fear appeal communications on Extended Parallel Process Model

Perceived Threat	Perceived Efficacy	Outcome
Low		Message Ignorance
High	Low	Fear Control (Defense Motivation)
High	High	Danger Control (Protection Motivation)

The ultimate goal of this study is to encourage foodservice directors to develop and implement a food defense management plan in their operations. Thus, the desired outcome is the danger control (protection motivation). Therefore, the foodservice directors' perceived threat of a terrorism attack should be high enough to lead them to evaluate the efficacy perceptions. Therefore, hypothesis 1 was proposed.

Hypothesis 1: Foodservice directors perceive a significant amount of threat of possible bioterrorism attacks.

To test the effect of protection motivation on behavioral intention, the following hypothesis was developed.

Hypothesis 2: Foodservice directors with higher protection motivation have higher intention to implement a food defense management plan.

Threat Appraisal

Threat appraisal concerns the process of evaluating the components of a fear appeal that are relevant to an individual's perception of how threatened he or she feels. Threat appraisal is a cognitive evaluation of risk perception (severity and vulnerability). Vulnerability assesses how personally susceptible an individual feels to the communicated threat. Severity perception measures how seriously the individual takes the threat. Based on a meta-analysis, correlations between threat appraisal variables and the intention to follow the recommended behavior were significant (Milne et al., 2000). However, the correlation coefficient for the severity perception and intention was smaller than all other associations between PMT variables and intention in most of the studies included in the meta-analysis. Several studies indicated that the vulnerability perception was the most significant predictor of behavioral intention (a.k.a. protection motivation). According to Das et al. (2003), vulnerability was the most important variable in persuading individuals to participate in stress management training programs. This relationship was mediated by negative emotions, such as fear and anxiety, and positive thoughts about the recommended solution. A meta-analysis conducted by Floyd et al. (2000) also found that threat vulnerability and self-efficacy had the strongest effect size with cancer prevention behaviors. However, this relationship varied depending on the behavior being assessed. Different results in the same meta-analysis study indicate that variables related to coping appraisal had stronger effects on AIDS prevention, medical-treatment regimens, healthy diet, and smoking cessation.

Based on the PMT model, the risk perception should affect the message recipients' intentions to follow the recommended behavior to decrease the risk. Most of the studies testing PMT reported a positive relationship between threat appraisal and protection motivation (e.g., Floyd et al., 2000; Milne et al., 2000; Rogers, 1983). In other words, the greater risk the message recipients perceived, the greater their intentions to follow the recommended behavior to reduce or eliminate the risk. Therefore, two research hypotheses were developed to test the relationships between the risk perceptions (severity perception of the bioterrorism attack and vulnerability perception of the operation to the risk) and their motivation to protect their operations. These hypotheses were as followed:

Hypothesis 3: When the foodservice directors perceive food terrorism as a severe risk, they have a higher motivation to implement a food defense management plan.

Hypothesis 4: When the foodservice directors perceive a food terrorism attack as highly possible, they have higher motivation to implement a food defense management plan.

Coping Appraisal

The coping-appraisal process evaluates the ability to cope with or prevent the threatened danger. The coping-appraisal process comprises efficacy variables and response costs. Response efficacy is the belief that the adaptive response will work. In other words, if the individual believes that taking protective action will be effective in protecting self or others, he/she will implement the action. Self-efficacy is the perceived ability of the person to initiate the adaptive response. Response costs are any costs (monetary, personal, time, effort) associated with implementing the adaptive coping response. Response efficacy and self-efficacy increases the probability of selecting the adaptive response, whereas response costs decrease the probability of selecting adaptive response (e.g., Rogers, 1983; Floyd et al., 2000; Milne et al., 2000).

Since the protective behavior is performed by the foodservice director on behalf of the organization and not based on their response as an individual, the efficacy should be measured accordingly. For example, the foodservice director may perceive he/she can implement a food security management plan, but, when organizational factors are considered, the foodservice director's perception may change. Measuring the self-efficacy level of a foodservice director, who is the decision maker, in implementing a food defense plan is necessary but not enough to predict the actual behavior change in an operation. Therefore, the present study examined the perception of foodservice directors related to foodservice operations' ability to implement the food defense management plan.

Based on findings of previous PMT studies (Floyd et al., 2000; Milne et al., 2000.), foodservice directors' efficacy perceptions should positively affect their motivation to protect their operations. Response cost, on the other hand, should negatively affect implementation intentions. To test these relationships and to meet two other study objectives ('Examining the on-site foodservice directors' perceived effectiveness of a food defense management plan'; 'Testing protection motivation theory in business setting'), the following three hypotheses are proposed.

Hypothesis 5: Perceived effectiveness of a food defense management plan positively affects the foodservice director's protection motivation.

Hypothesis 6a: Perception of the director's ability to implement a food defense management plan positively affects the foodservice director's protection motivation.

Hypothesis 6b: Perception of the operational ability to implement a food defense management plan positively affects the foodservice director's protection motivation.

Hypothesis 7: Perceived barriers to implementing a food defense management plan negatively affect the foodservice director's protection motivation.

Relationship Strengths among PMT Predictors

Result of the two different meta-analyses indicates that all PMT variables were significantly correlated with intention (Floyd et al., 2000; Milne et al., 2000). Individuals were more likely to adopt the recommended behaviors when they perceived the threats as severe, when they were more vulnerable to the threats, when the recommended behaviors were more effective, when they were able to follow the recommended behaviors, and when adopting the recommended behaviors required fewer resources. Also results revealed that self-efficacy had the strongest impact on protection motivation (the intention to follow the recommended behaviors) among the PMT variables followed by response efficacy.

Based on these findings of the meta-analyses, self-efficacy including organizational efficacy should be the strongest predictor of foodservice directors' intentions to implement a food defense management plan. Yoon and Shanklin (In Press) found that director participation in a seminar or training section related to biosecurity and operations, which assigns a primary responsibility for food biosecurity management to a specific employee, practiced security more often. Thus foodservice directors' participation in a biosecurity seminar or training may not only increase their awareness of the importance of preparedness against terrorism attack but may also improve both response efficacy perception and self-efficacy of implementing a food defense management plan. The fact that foodservice directors were worried about food bioterrorism or not did not significantly affect security practices when bioterrorism was considered with efficacy perception related variables in a regression model (Yoon & Shanklin, 2007a). Hence, foodservice directors' threat appraisal of food terrorism attack apparently is not as strong a factor in their implementation intentions as their efficacy perceptions.

References

- Abraham C. S., Sheeran, P., Abrams, D., & Spears, R. (1994) Exploring teenagers' adaptive and maladaptive thinking in relation to the threat of HIV infection. *Psychology and Health*, 9, 253-272.
- American Dietetic Association (2006a). HOD BACKGROUNDER: Safety of the Food and Water Supply - Food Safety Backgrounder FINAL 02-09-05. Retrieved June 12, 2005 from http://eatright.org/ada/files/Food_Safety_Backgrounder_FINAL_02-09-05.pdf
- American Dietetic Association (2006b). Suggested Ideas for Action - Food and Water Supply - For House of Delegates Mega Issue Discussion on Food and Water Safety FINAL 04-18-06. Retrieved June 12, 2005 from http://eatright.org/ada/files/Suggested_Ideas_for_Action_-_Food_and_Water_Supply.pdf
- Annis, H. M., & Davis, C. S. (1988). Assessment of expectancies. In Donovan, D. M., & Marlatt, G. A. (Eds.), *Assessment of addictive behaviors* (p 84-103). New York: Guilford Press.
- Anonymous (Jul/Aug, 2004). Final Rule on Detaining Suspect Food. *FDA Consumer* 38 (4) . Retrieved June 9, 2005 from http://www.fda.gov/fdac/departs/2004/404_upd.html#suspect.
- Axelrod, L., J., & Newton, J. W. (1991). Preventing nuclear war: Beliefs and attitudes as predictors of disarmist and deterrentist behavior. *Journal of Applied Social Psychology*, 21, 29-40.
- Baer J. S., & Lichtenstein, E. (1988). Cognitive assessment. In Donovan, D. M., & Marlatt, G. A. (Eds.), *Assessment of addictive behaviors* (p 104-110). New York: Guilford Press.
- Bandura A. (1986). *Social foundations of thought and action*. Englewood Cliffs, NJ:Prentice Hall.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84, 191-215.
- Bandura, A. (1988). Self-efficacy conception of anxiety. *Anxiety Research*, 1, 77-98
- Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes*, 50, 248-287.

- Bandura, A., Cioffi, D., Taylor, C. B., & Brouillard, M. E. (1988). Perceived self-efficacy in coping with cognitive stressors and opioid activation. *Journal of Personality and Social Psychology*, 55, 479-488.
- Bandura, A., Reese, L., & Adams, N. E., (1982). Micro-analysis of action and fear arousal as a function of differential levels of perceived self-efficacy. *Journal of Personality and Social Psychology*, 43, 5-21.
- Bandura, A., Taylor, C. B., Williams, S. L., Mefford, I. N., & Barchas, J. D. (1985). Catecholamine secretion as a function of perceived coping self-efficacy. *Journal of Consulting and Clinical Psychology*, 53, 406-414.
- Beck, K. H. & Lund, A. K. (1981). The effects of health threat seriousness and personal efficacy upon intentions and behavior. *Journal of Applied Social Psychology*, 11, 401-415.
- Beck, K. H., & Frankel, A. (1981). A conceptualization of threat communications and preventive health behavior. *Social Psychology Quarterly*, 44, 204-217.
- Bernier, M. & Avard, J., (1986). Self-efficacy, outcome and attrition in a weight reduction program. *Cognitive Therapy and Research*, 10, 319-338.
- Bledsoe, G. E., & Rasco, B. A. (2002). Addressing the risk of bioterrorism in food production. *Food Technology*, 56(2), 43-44, 46-47.
- Bruemmer, B. (2003). Food biosecurity. *Journal of American Dietetic Association*, 103(6), 687-691.
- Campis L. K., Pretice-Dunn, S., & Lyman, R. D. (1989). Coping appraisal & parents' intentions to inform their children about sexual abuse: A protection motivation theory analysis. *Journal of Social & Clinical psychology*, 8, 304-316.
- Center for Defense Information (July 2nd, 2003). A Brief history of terrorism. Retrieved June 12, 2005 from http://www.cdi.org/friendlyversion/printversion.cfm?documentID=1502&from_page=../program/document.cfm
- Centers for Disease Control and Prevention.(n.d.) Bioterrorism Agent/Diseases. Retrieved August 4, 2004 from <http://www.bt.cdc.gov/agent/agentlist-category.asp>.
- Chambliss, C. A., & Murray, E. J., (1979). Efficacy attribution, locus of control, and weight loss. *Cognitive Therapy and Research*, 3, 349-353.

- Donovan, D. M., & Marlatt, G. A. (Eds.) (1988). *Assessment of addictive behaviors*. New York: Guilford Press.
- Economic Research Services (2004). Briefing room: economics of foodborne disease: feature. *The Economics of Food, Farming, Natural Resources, and Rural America, United States Department of Agriculture*. Retrieved August 18th, 2005 from <http://www.ers.usda.gov/data/foodborneillness/>.
- Federal Emergency Management Agency. (2005). Informing the public about hazards- Backgrounder: Terrorism. Retrieved October 28, 2005 from <http://www.fema.gov/hazards/terrorism/terror.shtm>
- Floyd, D., L., Prentice-Dunn, S., & Rogers, R. W. (2000). A meta-analysis of research on protection motivation theory. *Journal of Applied Social Psychology*, 30, 407-429.
- Gerald, B. L., & Perkin, J. E. (2003). Position of the american dietetic association: Food and water supply. *Journal of American Dietetic Association*, 103(9), 1203-1218.
- Glynn, S. M., & Ruderman, A. J., (1986). The development and validation of an eating self-efficacy scale. *Cognitive Therapy and Research*, 10, 403-420
- Griffeth, R. W., Rogers, R. W. (1976). Effects of fear-arousing components of driver education on students' safety attitudes and simulator performance. *Journal of Educational Psychology*, 68, 501-506.
- Hall, M. J., Norwood, A. E., Fullerton, C. S., Gifford, R., & Ursano, R. J. (2004). The psychological burden of bioterrorism. *Journal of Aggression, Maltreatment & Trauma*, 9(1/2), 293-304.
- Hendrick, C., Giesen, M., & Borden, R. (1975). False physiological feedback and persuasion: Effect of fear arousal vs. fear reduction on attitude change. *Journal of Personality*, 43, 196-214.
- Higbee, K.L. (1969). Fifteen years of fear arousal: Research on threat appraisals: 1953-1968. *Psychological Bulletin* 72, 426-444
- Janis, I.L. (1967). Effects of fear arousal on attitude change: Recent developments in theory and experimental research. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 3, pp. 166-225). New York: Academic Press.

- Kantola, S. J., Syme, G. J., & Nesdale, A. R. (1983). The effects of appraised severity and efficacy in promoting water conservation: An informational analysis. *Journal of Applied Social Psychology*, 13, 164-182.
- Kaplan, R. M., Atkins, C. J., & Reinsch, S. (1984). Specific efficacy expectations mediate exercise compliance in patients with COPD. *Health Psychology*, 3, 223-242
- Kim, K. (2003). National restaurant association says Food & Drug Administration's proposed one-size-fits-all risk approach may have negative impact on industry, economy. *Nation's Restaurant News*, 39(14), 1-6.
- Lazarus, R. S., & Folkman, S., (1987). Transactional theory and research on emotions and coping. *European Journal of Personality*, 1, 141-170
- Leventhal, H. (1970). Findings and theory in the study of fear communications in L. Berkowitz (Ed.) *Advances in experimental social psychology* (Vol. 5, pp. 119-186). New York, NY: Academic.
- Litt, M. D. (1988). Self-efficacy and perceived control: Cognitive mediators of pain tolerance. *Journal of Personality and Social Psychology*, 54, 149-160.
- Manning, M. M. & Wright, T. L. (1983). Self-efficacy expectancies, outcome expectancies, and the persistence of pain control in childbirth. *Journal of Personality and Social Psychology*, 45, 421-431.
- Marlett, G. A., & Gordon, J. R. (Eds.). (1985). *Relapse prevention: Maintenance strategies in the treatment of addictive behaviors*. New York: Guilford Press.
- Milne, S. E., Shhran, P., & Orbell, S. (2000). Prediction and intervention in health-related behaviour: A meta-analysis review of protection motivation theory. *Journal of Applied Social Psychology*, 30, 106-143.
- Mulilis, J. P., & Lippa, R. (1990). Behavior changes in earthquake preparedness due to negative threat appeals: A test of protection motivation theory. *Journal of Applied Social Psychology*, 20, 619-638.
- Peregrin, T. (2002). Bioterrorism and food safety: What nutrition professionals need to know to educated the american public. *Journal of American Dietetic Association*, 102(1), 14-16.
- Prentice-Dunn, S., & Rogers, R. W. (1986). Protection motivation theory and preventive health: Beyond the health belief model. *Health Education Research*, 1, 153-161.

- Prewitt, M. (2005). NRN national report - executives say skills, training best defense against attack. *Nation's Restaurant News*, 39(14), 1-6.
- Rogers, R. W. (1975). A protection motivation theory of fear appeals and attitude change. *The Journal of Psychology*, 91, 93-114.
- Rogers, R. W. (1983). Cognitive and physiological processes in fear appeals and attitude change: A revised theory of protection motivation. In B. L. Cacioppo & L. L. Petty (Eds.), *Social psychophysiology: A sourcebook* (pp. 153-176). London, UK: Guilford.
- Schafer, R. B., Schafer, E., Bultena, G. L. & Hoiberg, E. O. (1993) Coping with a health threat: A study of food safety. *Journal of Applied Social Psychology*, 23, 386-394.
- Schwarzer, R. (1992). Self-efficacy in the adoption and maintenance of health behaviors: Theoretical approaches and a new model. In R. Schwarzer (Ed.), *Self-efficacy: Thought control of action* (pp. 217-243). Washington, DC: Hemisphere.
- Slater, M. D. (1989). Social influences and cognitive control as predictors of self-efficacy and eating behavior. *Cognitive Therapy and Research*, 13, 231-245.
- Smith-Klohn, L., & Rogers, R. W. (1991). Dimensions of severity of health threats: The persuasive effects of visibility, time of onset, and rate of onset on young women's intentions to prevent osteoporosis. *Health Psychology*, 10, 323-329.
- United States Department of Agriculture. (2003). A biosecurity checklist for school foodservice Programs: Developing a biosecurity management plan. Available at: <http://schoolmeals.nal.usda.gov/Safety/biosecurity.pdf>. Accessed September, 2004.
- United States Food and Drug Administration. (2003). The bioterrorism act of 2002. Retrieved September 3, 2004 from <Http://www.fda.gov/oc/bioterrorism/bioact.html>
- United States Department of Health and Human Services. (2005). Budget documents & information. Retrieved April 17, 2005 from <http://www.hhs.gov/budget/docbudget.htm>
- Weinberg, r. S., Hughes, H. H., Critelli, J. W., England, R., & Jackson, A. (1984). Effects of preexisting and manipulated self-efficacy on weight loss in a self-control program. *Journal of Research in Personality*, 18, 352-358.
- Weinstein, N. D. (1987). Unrealistic optimism about illness susceptibility: Conclusions from a community-wide sample. *Journal of Behavioral Medicine*, 10, 481-500.
- Weinstein, N. D. (1993). Testing four competing theories of health-protective behavior. *Health Psychology*, 12, 324-333

- Weinstein, N. D. (1993). Testing four competing theories of health-protective behavior. *Health Psychology*, 12, 324-333.
- White, P. (2002). Food security. *School Foodservice and Nutrition*, 56(8), 42-46.
- Witte, K. (1992). Putting the fear back into fear appeals: The Extended Parallel Process Model. *Communication Monographs*, 59(4), 329- 349.
- Witte, K., Berkowitz, J. M., Cameron, K. A., & McKeon, J. K. (1998). Preventing the spread of genital warts: Using fear appeals to promote self-protective behaviors. *Health Education and Behavior*, 25, 571-585.
- Wolf, S., Gregory, W. L., & Stephen, W. G. (1986). Protection motivation theory: Prediction of intentions to engage in anti-nuclear war behaviors. *Journal of Applied Social Psychology*, 16, 310-321.
- World Health Organization. (2002). Terrorist threats to food: Guidance for establishing and strengthening prevention and response systems. Retrieved August 4, 2004 from http://www.who.int/foodsafety/publications/fs_management/terrorism/en/
- Wurtele, S. K. & Maddus, J. E. (1987). Relative contributions of protection motivation theory components in predicting exercise intentions and behavior. *Health Psychology*, 6, 453-466.
- Yoon, E. & Shanklin, C.W. (2007a). Food security practice in Kansas schools and healthcare facilities. *The Journal of American Dietetic Association*, 107(2), 325-329.
- Yoon, E. & Shanklin, C.W. (2007b). Implementation of food biosecurity management plan against food terrorism in on-site foodservice operations. *Journal of Hospitality and Tourism Research*, 31(2), 224-240.

CHAPTER 3 - Methodology

The main purposes of this study were to 1) investigate foodservice director perceptions of and preparedness for food bioterrorism, 2) explore foodservice director perceptions of the effectiveness of a food defense management plan, and 3) apply the protection motivation theory to investigate foodservice directors' intentions to implement a food defense management plan. A cross sectional study was conducted to test the hypotheses. A quasi-experimental research design was attempted to differentiate the response efficacy perception. The sample was divided into two groups for the experiment: one group was provided with minimal information about the food defense management plan, and the other group was given detailed information about the plan. This experimental approach was attempted to investigate whether the amount of information could differentiate the message recipients' perception about a food defense management plan. It was assumed that the message recipient with more detailed information about a food defense management plan would appraise implementing the plan in the operation as more effective than the message recipients with brief information do.

This chapter discusses the research design and the data analysis procedures that were used to achieve the research objectives. Flow charts of the research procedures of this study are presented in Figures from 3-1 to 3-3. Figure 3-1 describes the development and refinement of the measurement scales. Figure 3-2 and Figure 3-3 figures illustrate data collection procedures and data analysis steps.

Population and Sample

The population of the study was foodservice directors in both acute healthcare and school districts in the United States. The healthcare foodservice directors who participated were members of one of the following professional organizations: Healthcare Foodservice Management (HFM) and American Society for Healthcare Foodservice Administrators (ASHFSA). A mailing list of school foodservice directors was purchased from the Market Data Retrieval (MDR), which provides mailing lists of school districts and updates its mailing list two times a month (personal communication, 2006). This company has information about 14,115 public school districts, 88,326 public schools in districts, 11,197 site-based managed districts,

5,379 districts with Title I school-wide programs, and 11,447 districts with URL addresses (MDR, n.d.). The company specifies individuals in schools in 10 categories and approximately one hundred detailed positions. One of the job specifications is foodservice director. A mailing list of 1,232 school foodservice directors in the school districts with enrollment more than 7,500 was purchased in May 2006.

HFM provided a mailing list of their 1,441 members; and ASHFSA provided mailing addresses for their 780 members in May 2006. These two lists were combined and screened for members who are not foodservice directors (e.g., instructors, CEOs, marketing personnel). Individuals with memberships in both associations were included only once in the final database. Members without a job title associated with foodservice were eliminated from the list. Healthcare institutions were also screened to make sure that only one person from each institution was in the database. If two or more potential participants came from the same healthcare institution, the individual who was listed as director or associate director was selected. For example, if one person was an administrative dietitian, another person was a director of food and nutrition services, and the third was an executive chef from the same hospital, the director of food and nutrition services was included, and the other two people removed from the list. The result was a list of 1,215 healthcare foodservice directors. The total number with combined sample was 2,447 from 50 states and D. C.

Table 3-1 shows the composition of the sampling frame. Slightly more than 10% of foodservice directors were employed in California ($n = 274$; 11.2%). Other states with 4% - 7.6% of the same population included Texas ($n = 185$; 7.56%), New York ($n = 150$; 6.13%), Pennsylvania ($n = 116$; 4.74%), and Ohio ($n = 109$; 4.45%).

States with fewest foodservice directors were Vermont ($n = 3$; 0.12%), Washington D.C. ($n = 6$; 0.25%), and Rhode Island ($n = 7$; 0.29%). No school foodservice directors from Maine and Vermont were included in the mailing list from MDR because an enrollment of 7,500 in the school district was required.

A sample of 1,100 school foodservice directors and 1,100 healthcare foodservice directors were randomly selected from the sampling frame. A response rate of approximately 20 ~ 25% was expected for this study based on the response rates in the previous empirical study of on-site foodservice directors' level of biosecurity preparedness (Yoon & Shanklin, 2006).

Therefore, 200 ~ 250 responses from each type of foodservice operation were expected and needed for structural equation modeling (Hair, Anderson, Tatham, & Black, 1998).

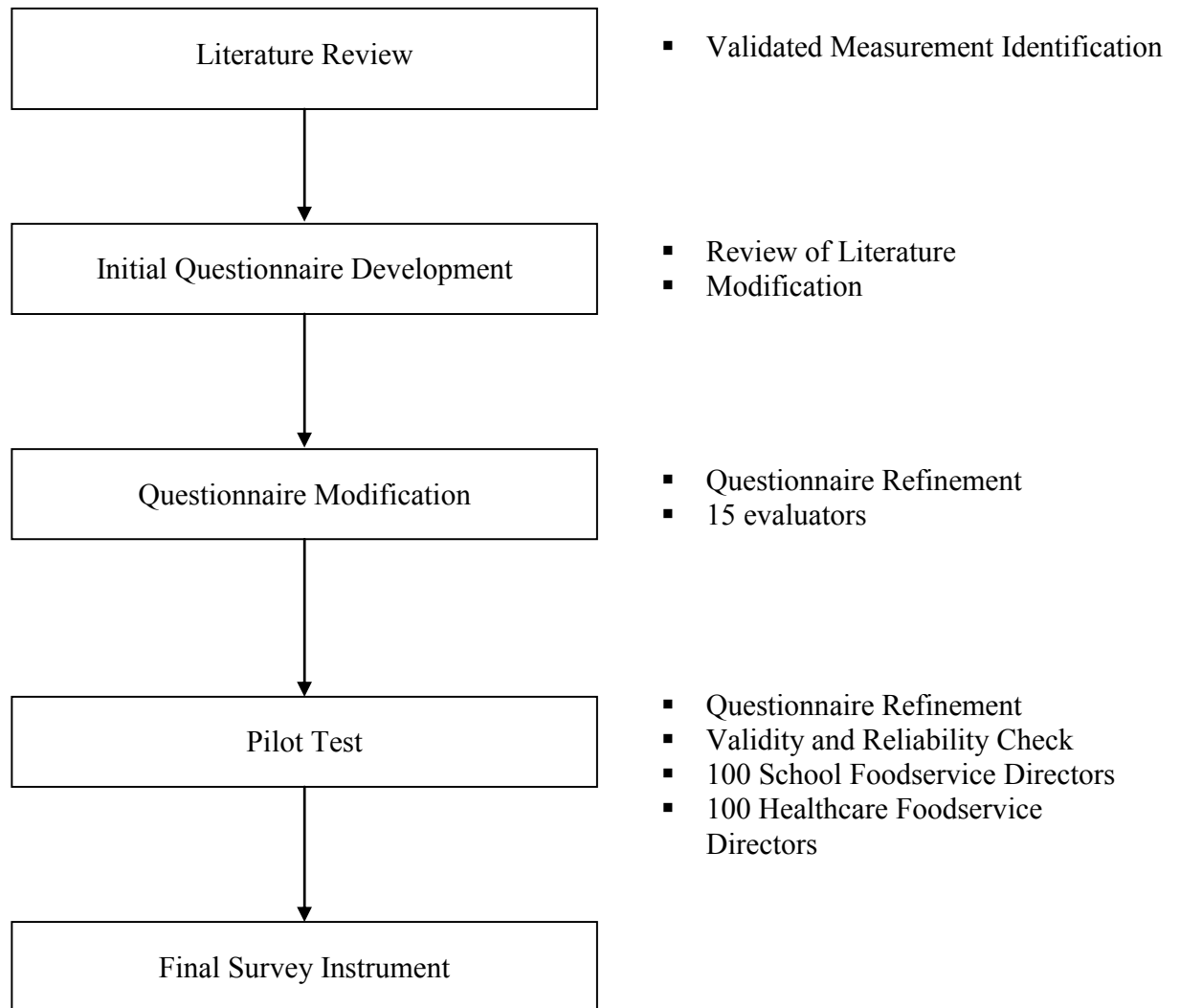
Table 3.1 Number of Samples From Different States

STATE	Healthcare (N=1215)	School (N=1232)	Total (N=2447)	STATE	Healthcare	School	Total
CA	68	206	274	OR	17	18	35
TX	63	122	185	OK	22	12	34
NY	113	37	150	CT	13	19	32
PA	90	26	116	IA	15	9	24
OH	76	33	109	UT	9	15	24
FL	42	47	89	KS	16	7	23
IL	57	29	86	WV	11	12	23
NC	24	61	85	MS	13	9	22
GA	33	46	79	AR	10	10	20
MI	35	38	73	NE	15	5	20
NJ	36	32	68	NM	3	13	16
WA	28	40	68	NV	8	6	14
IN	35	30	65	NH	11	2	13
VA	21	41	62	SD	10	2	12
MO	35	24	59	ID	5	6	11
AZ	22	28	50	ME	11	0	11
LA	19	31	50	ND	9	2	11
SC	15	31	46	MT	5	4	9
TN	21	24	45	WY	6	3	9
WI	34	11	45	AK	4	4	8
MN	18	26	44	DE	3	5	8
AL	17	26	43	HI	7	1	8
MA	24	17	41	RI	4	3	7
CO	17	23	40	DC	5	1	6
KY	19	17	36	VT	3	0	3
MD	18	18	36				

The Instrument Development

Because there was no existing instrument for measuring protection motivation in an organizational setting, the research instrument for this study was developed following the steps illustrated in the Figure 3-1.

Figure 3.1 Procedure for Survey Instrument Development



Initial Questionnaire Development

Measurement items were developed from two different sources: previous literature and interviews with experts and practitioners. Based on an extensive review of literature related to protection motivation theory and fear appeal persuasion, a questionnaire was developed that measured the foodservice directors' perceived effectiveness of a food defense management plan, their perceived ability to implement the plan, and their perception of the severity of and

vulnerability to a terrorism attack. Items measuring current practices in the on-site foodservice operations and directors' perception of the importance of these practices were added after interviews with researchers whose expertise is food safety and biosecurity and with industry professionals whose responsibility is directing foodservice departments in healthcare operations or schools. Fifteen researchers and industry professionals were participate in the interviews.

All constructs were measured using at least three items. All items were measured using 7-point Likert type scales except for demographic questions. For structural equation modeling (SEM) to test hypotheses, each construct should be properly identified. Therefore, the number of items within each construct must be greater than three to avoid under-identification problem. Development of items within each construct is described below and specific measurement items and scales are included in Appendix A.

Measuring Threat Appraisals – perceived severity & perceived vulnerability

Threat appraisal is a cognitive evaluation of risk perception. Vulnerability assesses how personally susceptible an individual feels to the communicated threat. Severity perception measures an individual's belief about the seriousness of the consequences of the threatening event. In empirical studies, these variables have been measured using Likert type scales that requested study participants to check their level of agreement with several statements (e.g., Block & Keller, 1995; Brown, 2005; Campis, Prentice-Dunn, & Lyman, 1989; Kals & Montada, 2001; Rhodes & Plotnikoff, 2005; Ronis & Harel, 1998; Melamed et al., 1996; Umeh, 2005; Witt et al., 1998;) or their level of agreement that the statements were true (e.g., Aspinwall et al., 1991; Axelrod & Newton, 1991; Ho, 1998; Kulik & Mahler, 1987; Mcmath & Prentice-Dunn, 2005). The scales in these studies ranged from 4 to 15. A few other studies used a bipolar scale or a semantic differential scale (e.g., Hartenian, Bobko, & Berger, 1993; Kantola, Syme, & Nesdale, 1983)

This study measured severity of and vulnerability to food terrorism. The perceived risk of food terrorism at a foodservice director's own facility should be the major focus of the measurement items. However, their perception of terrorism in the food supply chain in the U. S. should not be neglected. Unrealistic optimism could possibly affect their answers. For example, even though foodservice directors may feel that every component of food supply chain is at high risk, they may feel their own facilities face minimal risk. Unrealistic optimism refers to the phenomenon that people systematically overestimate the probability that good things will happen

to them and underestimate the probability that bad things will happen to them (Weinstein, 1987). Thus, study participants' severity and vulnerability perception of both their own facilities and industry as a whole were assessed to determine whether they possess unrealistic optimism. For example, "the food supply chain in the U. S. is at risk of a terrorist attack" measured the perceived vulnerability for the U. S. food chain as a whole, while "it is likely that someone will attack my operation" assessed the perceived vulnerability specific to the participant's own facility. Specific items measuring perceptions regarding food terrorism can be found on the section B of the questionnaire (Appendix A).

Measuring fear

Even though the original PMT model assumes that the fear is aroused without assessing it directly, the affective appraisal of risk communication, the fear, adds precision to the model. PMT only evaluates the cognitive process, ignoring the importance of the emotion-as-motivation conceptualization in psychology (Tanner, Hunt, & Eppright, 1991). Therefore, a 7-point Likert type scale measured fear using terms such as frightening, scary, fearful, anxiety, and nervous. Specific items measuring perceptions of food terrorism can be found in section B of the questionnaire (Appendix A).

Measuring Coping Appraisals – Response Efficacy, Response Cost, Self-efficacy, and Operational Efficacy

The coping-appraisal process evaluates the ability to cope with or prevent the threatened danger. Factors comprising the coping-appraisal process are efficacy variables and response costs. Response efficacy is the belief that the adaptive response will work. In other words, it is individual's belief that taking protective action will be effective in protecting self or others. Self-efficacy is the perceived ability of the person to initiate the adaptive response. Response costs are any costs (monetary, personal, time, effort) associated with implementing the adaptive coping response.

Since the protective behavior is performed by the foodservice director on behalf of the organization and not based on their response as an individual, the efficacy should be measured accordingly. For example, foodservice directors may perceive that they have the ability to implement a food security management plan; however, when organizational factors are considered, the foodservice directors' perception of their ability may change. Measuring the self-

efficacy level of a foodservice director, who is the decision maker, in implementing a food defense plan is necessary but not enough to predict the operation's actual behavior change. Therefore, the present study included the perception of the foodservice directors related to foodservice operations' ability to implement the food defense management plan.

In section B of the questionnaire, the study participants' perceptions of response efficacy and response cost of a food defense management plan were measured (Appendix A). Self-efficacy and organizational efficacy related to the participants' perceived ability to implement a food defense management plan were assessed. Foodservice directors indicated the extent to which they agree with each item in a 7-point Likert type scale.

Manipulation of Response Efficacy

The explanation of the food defense management plan was included at the beginning of the questionnaire. A few true/false questions were inserted after the explanation of the food defense management program to determine if the participant read the explanation. The true/false items were derived from the content of the explanation. The amount of information released to the readers was differentiated to assess if the perceived effectiveness (efficacy) of the food defense management plan is higher for the study participants who receive more detailed information than participants who receive less detailed information. Foodservice directors from 550 healthcare operations and 550 school districts received the more detailed version of the food defense management plan description while those from the 550 other healthcare operations and 550 other school districts received the shorter version.

In the brief explanation, a food defense management plan was defined and then various types of attackers were elucidated. A simple one-sentence explanation of how a food defense management plan works was provided. The following one sentence description was included. "A food defense management plan identifies possible attackers and agents and describes practical security measures that should be implemented" (Appendix B). The longer form explained the steps in developing and implementing a food defense management plan including who should be included in the management team, how to audit the facility (Appendix C). Resources that may help the foodservice director understand a food defense management plan and develop and implement such a plan were included in a subsequent paragraph. These resources were from governmental agency website such as USDA (<http://schoolmeals.nal.usda.gov/Safety/biosecurity.pdf>) and the FDA

(<http://www.cfsan.fda.gov/~dms/secgui11.html>). The resources also included information about courses and workshops provided by Kansas State University and American Institute of Baking International.

Manipulation Check

Attitude about a food defense management plan was measured using four bipolar semantic differential scales to check whether the manipulation was successfully accomplished. A statement, “I think a food defense management plan is _____ for addressing food terrorism in a foodservice operation” required the study participants to fill in the blank by indicating their thought as ‘ineffective or effective’, ‘bad or good’, ‘undesirable or desirable’, ‘useless or helpful’ in the range of –3 to 3. The negative attitude measurements, such as ineffective, bad, undesirable, and useless are –3 while the positive terms were assigned a value of 3. The questionnaire provided an example of how to answer the question correctly (section B in Appendix A).

Motivation

Unlike other previous PMT studies that did not measure the extent to which the message motivated the respondents to act, this study actually measured the motivation using approach/avoidance motivation. Measurement items assessing the motivation were adopted from approach-avoidance motivation concept. Approach motivation is distinguished from the avoidance motivation. Approach motivations are directed towards desirable outcomes while avoidance motivations are directed away from undesirable outcomes (Lieberman, 2003). Elliot (2006) contended that the approach-avoidance distinction was used over 2000 years ago. He defined approach motivation as “the energization of behavior by, or the direction of behavior toward, positive stimuli (objects, events, possibilities)” and avoidance motivation as “energization of behavior by, or the direction of behavior away from, negative stimuli (objects, events, possibilities) (Elliot, 2006 p.112). In this study, approach motivation geared towards evaluating how much the respondents want to protect their operations (e.g. I want to protect my customers from harmful events) while avoidance motivation was evaluating how much they want to stay away from the terrorism risk (e.g. I want to reduce a food terrorism risk as much as possible) (Appendix A). As a result of utilizing the approach-avoidance concept, this study was expected to measure different dimensions of the motivation.

Measuring Outcomes of Appraisals – Protection Motivation versus Fear Control

The evaluation of a fear appeal initiates two appraisals of the message. This appraisal result in one of two outcomes: adoptive coping (i.e., danger control) and maladaptive coping (i.e., message ignorance and fear control). People engage in danger control processes when they believe they are easily, feasibly, and effectively able to avert a serious and relevant threat from occurring by adopting the recommended response. In contrast, people engage in fear control processes when they do not think they are able to adopt a recommended response because it is perceived as too difficult, too costly, or too time consuming (low self-efficacy) or they think it will not effectively avert the threat (low response efficacy). When fear control processes occur, people give up trying to control the danger and, instead, turn to controlling their fear. Thus, low perceived efficacy combined with high perceived threat promotes fear control responses such as denial, defensive avoidance, or reactance, which result in rejecting the message's recommendations (Witte et al., 1998).

Even though the main purpose of this study was to explore how likely foodservice operations are to implement a food defense management plan (protection motivation or danger control), investigation of maladaptive response would provide a more thorough picture of the phenomenon. In order to assess these possible outcomes, measurement items for the intention to implement a food defense management plan, the attitude toward a food defense management plan, and message denial were included in the instrument. In terms of the intention to implement a plan, it is possible that an operation has already implemented such a plan or has been developing a plan. Therefore, the questionnaire was designed to screen these operations by using two branching questions. These questions used a dichotomous scale. In the first screening question, the study participants were asked whether they have already implemented a food defense management plan. If the respondents already had implemented a plan, they were asked whether the plan is continuously monitored and updated. After they answered these two questions, they were instructed to go to the next section. If the respondents had not implemented a plan, the respondents were asked whether their operation is currently developing a food defense management plan. If the respondents indicated that they were not currently developing a food defense management plan, they were asked to answer three questions which measured their intention to implement a plan. A 7-point Likert type scale was used to measure the intention to develop a plan. Otherwise, the respondents proceeded to the next section of the questionnaire.

Specific items that screen respondents and measure intention are in section D of the questionnaire (Appendix A).

Besides the implementation intention, attitude toward food terrorism was measured using bipolar semantic differential scale (Witte et al., 1998). The study participants were asked to fill in the blank for statements by checking numbers in each item that best represents their thoughts. Participants' attitudes toward food terrorism were measured using the following statement: "When I heard about food terrorism, my first instinct was to _____. The response options for this item were 'not want to think about it or want to think about it' and 'not want to do something extra to deal with it or want to do something to protect the operation.' This statement was modified from the study conducted by Witte et al., (1998) to check the defensive avoidance, a type of fear control response. Message denial or issue derogation (Witte et al., 1998), another type of the fear control response, was assessed with the following statements: "It is unnecessary to worry about a food terrorism attack" and "Food terrorism attack is unrealistic. It will never happen to foodservice industry." A 7-point Likert type scale with 1 being strongly disagree and 7 being strongly agree was used to measure message denial.

Current Food Defense/Biosecurity Practice

The result of Yoon and Shanklin's 2006 study revealed that on-site foodservice operations that had planned to develop a food biosecurity management plan, who had employee(s) whose primary responsibility was to monitor food biosecurity practices, and had a manager or director who had participated in one or more seminars or training sessions related to food biosecurity were more likely to practice biosecurity measures. Findings from a meta-analysis performed by Milne et al. (2000) showed that all PMT variables were significantly correlated with concurrent behavior. Among the variables, the intention had the largest association with concurrent behavior. Therefore, inspection of current behavior should add precision to the study results.

Yoon and Shanklin (2007a, 2007b) developed 35 items to measure biosecurity practices. However, including all 35 items in this instrument would make the instrument too long. Therefore, a panel of experts including food safety and security researchers in higher education institutions, local health department representatives, and foodservice directors were invited to indicate 10 to 15 of the most critical practices and to suggest additional changes. Opinions about

the list of practices and their general thoughts about current practices in the foodservice operations were discussed through email communications, telephone or face-to-face interviews.

Questionnaire Modification

Fifteen experts including food safety and security researchers in higher education institutions, local health department representatives, and foodservice directors evaluated the initial questionnaire using a semi-constructed evaluation form (Appendix D). The initial questionnaire and an evaluation form were delivered to these experts along with a brief introduction to PMT and the relevance of PMT to the study (Appendix E). Most of these experts were from Midwestern states but one health communication expert was a professor at a university located in the Eastern U. S. Two industry experts were from a southern state and western state. Besides critiquing the questionnaire, they also were asked to select the most critical 10 practices from the lists of 35 defensive practices, which were used in the previous study (Yoon & Shanklin, 2007a; 2007b).

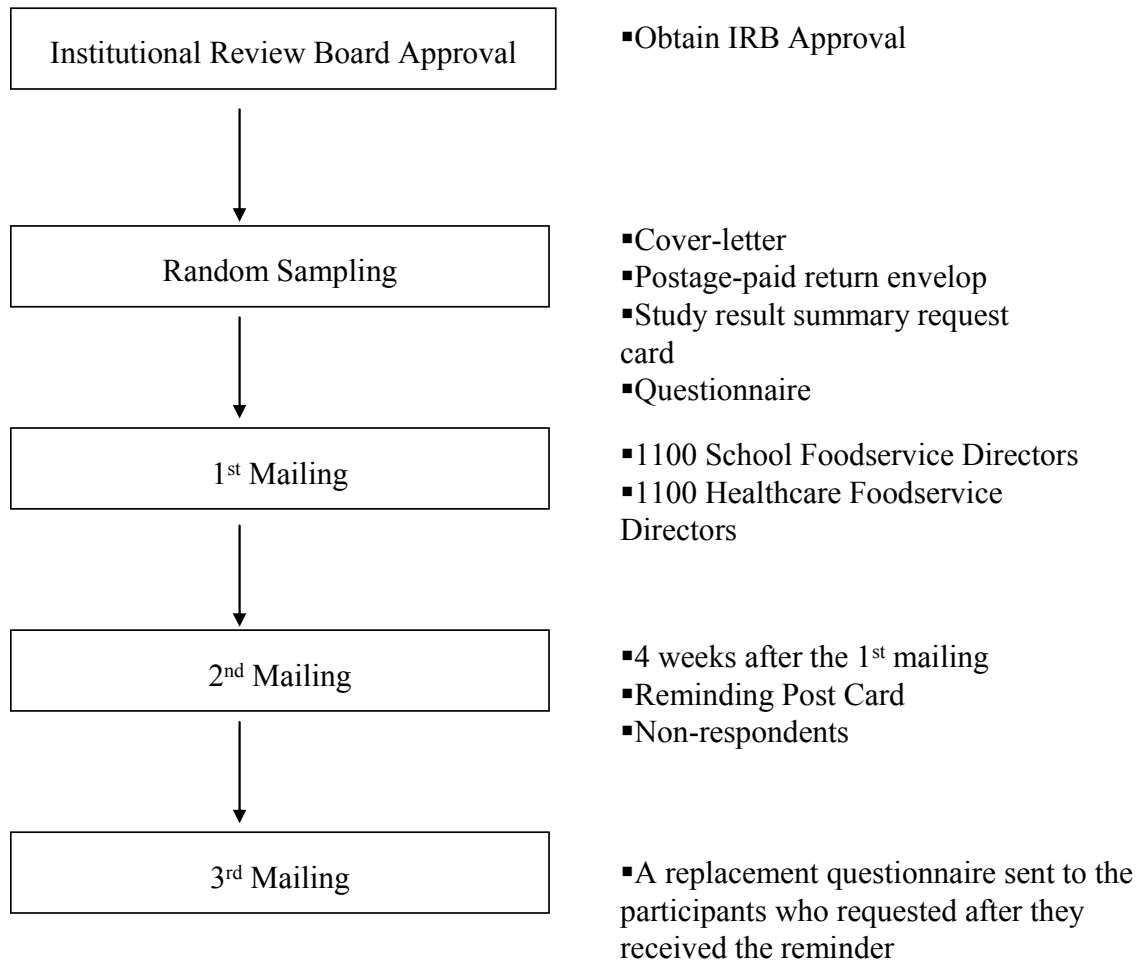
Pilot test

After modification, as the last step of the questionnaire development stage, a pilot test was conducted in February 2007 with 200 foodservice directors not included in the sample. The purpose of the pilot test was to detect measurement errors and to assess the reliability of multiple measurements and the validity of the questionnaire. Based on the pilot test result, reliability was evaluated using Cronbach's alpha. Because of the low response rate (11%), discriminant validity of measurement items could not be assessed by any means. However, the correlations between variables provided evidence of convergent validity; results are discussed in the Chapter V.

Data Collection

Survey data collection procedures are illustrated in Figure 3-2. Institutional Review Board (IRB) approval was obtained before the data collection. In accordance with the requirements of the KSU IRB, the investigator should complete the training and education modules designed for studies involving human subjects and then obtain IRB's approval of the study before the pilot test.

Figure 3.2 Procedure for Survey Data Collection



The questionnaire, a cover letter that explains the nature and purpose of the study, a postage-paid return envelope, and a complimentary result request card was mailed first class to a sample of 2,200 foodservice directors as previously described. As an incentive to encourage responses, foodservice directors were offered a summary of the results. Respondents desiring a summary were asked to return the enclosed request card. In addition, a two dollar donation to a choice of association scholarship funds, including School Nutrition Association (SNA), Healthcare Foodservice Management (HFM), or American Society for Healthcare Foodservice Administrators (ASHFSA), or two additional research organizations, the March of Dimes and the National Breast Cancer Foundation, were offered to encourage participation. These first three associations were chosen because the samples were recruited from these associations. The other

two organizations were selected because study participants were anticipated to be predominantly women employed as foodservice directors in schools and healthcares. Women have a higher interest in these organizations and are likely to support research associated with diseases of special interest to females. These organizations were listed at the end of the survey questionnaire for the respondent to indicate their choice.

Four weeks after the questionnaire was mailed, a reminder post card was sent to non-respondents. Replacement questionnaires were mailed to the directors who requested one after they received the reminder.

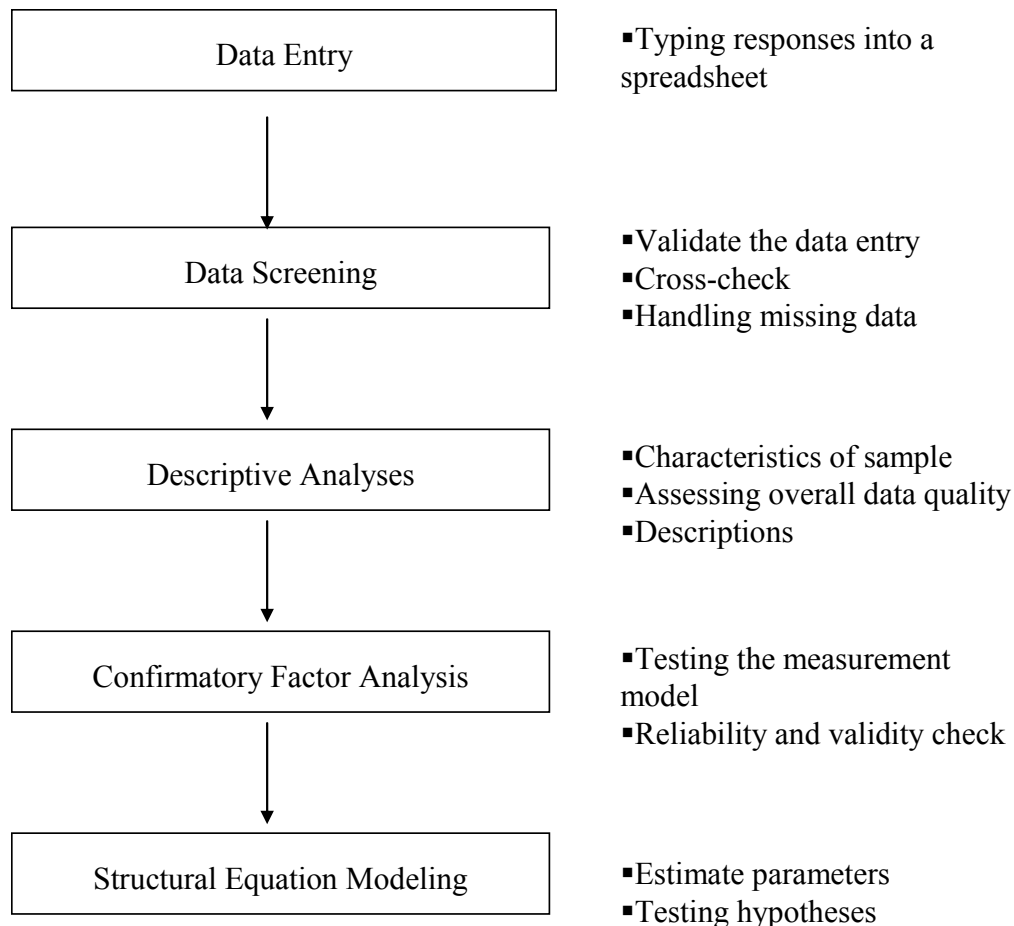
Data Analyses

SPSS version 13 for Windows (2004, SPSS Inc., Chicago, IL) and AMOS 4.0 (2004, SPSS Inc., Chicago, IL) were used for all data analyses. After data entry, it was verified by two different individuals before analyzing the data. The data collected after the initial mailing and the data collected after the reminder mailing were combined to test hypotheses. Before performing actual data analyses, however, sets of independent t-tests among key variables were performed to determine whether there were differences between initial responses and responses after the reminder mailings. Levene's tests for equality variances in two groups for all variables tested should not be significant. In other words, variances for the key variables in initial and two follow-up responses must statistically be the same. The t-tests results also should not be significant for all these tested variables. Levene's tests for equality variances in two groups for all tested variables were not significant at α level of 0.05. A set of t-test results were also not statistically different between initial and after reminder responses. In other words, variances for the key variables in initial and the follow-up responses were not statistically different. Because no significant differences were found between the two groups, the data were combined for analyses without any restrictions.

Descriptive statistical data analyses were performed to address some of the research questions and to determine the overall characteristics of respondents based on the demographic variables such as age, gender, years in profession, and level of education. Frequencies, means, and standard deviations were calculated using all responses collected. In addition, statistical analyses were used to compare characteristics of foodservice directors in schools and healthcare

operations. Chi-square analyses were conducted for group comparisons for categorical variables, and t-tests were performed for continuous variables.

Figure 3.3 Procedure for Survey Data Analysis



The proposed path model was analyzed using the two-step approach suggested by Anderson and Gerbing (1988). These authors recommended that researchers first evaluate the internal and external consistency of variables before evaluating the structural portion of a model. Each step of the data analysis procedure is explained in the following discussion. A satisfactory level of reliability and validity of the measurement model must be met before testing causal relationships among the constructs in the structure model (Fornell & Larcker, 1981). The function of a measurement model is to clarify how well the observed indicators serve as a measurement for the latent variables (Joreskog & Sorbom, 1998). Specifically, a reliability check

was performed to assess internal consistency among manifesting items for each construct. A validity check also was conducted to estimate the degree to which a measurement represents and logically connects the observed phenomenon to the construct. A confirmatory factor analysis (CFA) was performed to assess the validity of measurements. Composite reliabilities were calculated to examine the reliability of measurement items. Following the recommendation of Hair et al. (1998), an alpha level of .70 or higher indicates measurement reliability. Construct validity was assessed using average variance extracted (AVE) and correlation matrix. AVE should be higher than .50 in order to satisfy convergent validity. Discriminant validity was assessed by comparing AVE with the squared correlation between two latent constructs. As Anderson and Gerbing (1988) suggested, the AVE value in each construct exceeding the squared correlation between the two constructs indicates that the discriminant validity is satisfied.

After checking the reliability of variables and acquiring the construct validity, structural equation modeling (SEM) was performed to test research hypotheses simultaneously. Compared to multiple regression, SEM includes more flexible assumptions, use of confirmatory factor analysis to reduce measurement error by having multiple indicators per latent variable, testing models over rather than coefficients individually, and a graphical modeling interface.

References

- Anderson J. C. and Gerbing D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychology Bulletin*, 103(3), 411-423.
- Aspinwall L.G., Kemeny, M. E., Taylor S. E., Schnider, S. G., Dudley, J. P., (1991) Psychological predictors of gay men's AIDS risk-reduction behavior. *Health Psychology*, 10, 432-444.
- Axelrod, L., J., & Newton, J. W. (1991). Preventing nuclear war: Beliefs and attitudes as predictors of disarmist and deterrentist behavior. *Journal of Applied Social Psychology*, 21, 29-40.
- Block, L. G. & Keller, P. A. (1995). When to accentuate the negative: the effects of perceived efficacy and message framing on intentions to perform a health-related behavior. *Journal of Marketing Research*, 32, 192-203.
- Brown, S. L. (2005). Relationship between risk-taking behavior and subsequent risk perceptions. *British Journal of Psychology*, 96, 155-164.
- Campis L. K., Pretice-Dunn, S., & Lyman, R. D. (1989). Coping appraisal & parents' intentions to inform their children about sexual abuse: A protection motivation theory analysis. *Journal of Social & Clinical psychology*, 8, 304-316.
- Chen, M. S., & Land, K. C., (1986). Testing the health belief model: LISREL analysis of alternative models of casual relationships between health belief and preventive dental behavior. *Social Psychology Quarterly*, 49, 45-60.
- Das, E. H. H., Wit, J. B. F., & Stroebe, W. (2003). Fear appeals motivate acceptance of action recommendations: Evidence for a positive bias in the processing of persuasive messages. *Personality and social Psychology Bulletin*, 29(5), 650-664.
- Dillman, D.A. (2000). *Mail and Internet Surveys: The Tailored Design Method* (2Ed). New York, NY: John Wiley & Sons, Inc.
- Fornell C. & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18, 39-50.
- Hair, J. A., Anderson, R. E. Tatham, R. L. and Black, W. C. (1998). *Multivariate Data Analysis* (5th ed.), Prentice Hall, Upper Saddle River, NJ.

- Hartenian, L. S., Bobko, P., & Berger, P. K., (1993). An empirical validation of bipolar risk perception scaling methods. *Journal of Applied Social Psychology*, 23(5), 335-351.
- Ho, R. (1998). The intention to give up smoking: Disease versus social dimensions. *The Journal of Social Psychology*, 138(3), 368-380.
- Kals E., & Montada, L. (2001). Health behavior: An interlocking personal and social task. *Journal of Health Psychology* 6(2) 131-148.
- Kantola, S. J., Syme, G. J., & Nesdale, A. R. (1983). The effects of appraised severity and efficacy in promoting water conservation: An informational analysis. *Journal of Applied Social Psychology*, 13, 164-182.
- Kulik, J. A., & Mahler, H. I. M. (1987). Health status, perceptions of risk, and prevention interest for health and nonhealth problems. *Health Psychology*, 6, 15-27.
- Mcmath, B. F. & Prentice-Dunn, S. (2005). Protection motivation theory and skin cancer risk: The role of individual differences in responses to persuasive appeals. *Journal of Applied Social Psychology* 35(3), 621-643.
- Melamed, S., Rabinowitz, S., Feiner, M., Weisberg, E., & Ribak, J. (1996). Usefulness of the protection motivation theory in explaining hearing protection device use among male industrial workers. *Health Psychology*, 15(3), 209-215.
- Milne, S. E., Shhran, P., & Orbell, S. (2000). Prediction and intervention in health-related behaviour: A meta-analysis review of protection motivation theory. *Journal of Applied Social Psychology*, 30, 106-143.
- Ronis, D. L., & Harel, Y. (1989). Health belief and breast self-examination behaviors: Analysis of linear structural relations. *Psychology and Health*, 3, 259-285
- Schafer, R. B., Schafer, E., Bultena, G. L. & Hoiberg, E. O. (1993) Coping with a health threat: A study of food safety. *Journal of Applied Social Psychology*, 23, 386-394.
- Tanner, J. F., Hunt, J. B. & Eppright, D. R. (1991). The protection motivation model: a normative model of fear appeals, *Journal of Marketing*, 55, 36-45.
- Umeh, K. (2005). Protection motivation, coping styles and health-related behavioral intentions amongst adolescents. *Psychology and Health*.
- United States Department of Agriculture. (2003). A biosecurity checklist for school foodservice Programs: Developing a biosecurity management plan. Available at: <http://schoolmeals.nal.usda.gov/Safety/biosecurity.pdf>. Accessed September, 2004.

- United States Food and Drug Administration. (2003). Retail Food Stores and Food Service Establishments: Food Security Preventive Measures Guidance (Final Guidance). Retrieved September 3, 2004 from [Http://www.cfsan.fda.gov/~dms/secgui11.html](http://www.cfsan.fda.gov/~dms/secgui11.html)
- Weinstein, N. D. (1987). Unrealistic optimism about illness susceptibility: Conclusions from a community-wide sample. *Journal of Behavioral Medicine*, 10, 481-500.
- Weinstein, N. D. (1993). Testing four competing theories of health-protective behavior. *Health Psychology*, 12, 324-333.
- Witte, K. (1992). Putting the fear back into fear appeals: The Extended Parallel Process Model. *Communication Monographs*, 59(4), 329- 349.
- Witte, K., Berkowitz, J. M., Cameron, K. A., & McKeon, J. K. (1998). Preventing the spread of genital warts: Using fear appeals to promote self-protective behaviors. *Health Education and Behavior*, 25, 571-585.
- Yoon, E. & Shanklin, C.W. (2007a). Food security practice in Kansas schools and healthcare facilities. *The Journal of American Dietetic Association*, 107(2), 325-329.
- Yoon, E. & Shanklin, C.W. (2007b). Implementation of food biosecurity management plan against food terrorism in on-site foodservice operations. *Journal of Hospitality and Tourism Research*, 31(2), 224-240.

CHAPTER 4 - US On-site Foodservice Directors' Perceptions Related to Intentional Food Contamination and Food Defense Management Plan

Abstract

The purpose of this study was to investigate the perceptions that on-site foodservice directors possess about intentional food contamination and its prevention through implementation of a food defense management plan. A questionnaire was developed based on the Protection Motivation Theory and approach-avoidance motivation to measure foodservice directors' perceptions, motivations, and food defense management implementation intention. A total of 449 foodservice directors from school districts and healthcare operations in the U. S. participated in the study. U.S. on-site foodservice directors perceived that the result of a food terrorist attack would be severe but the chances it would occur in their operations is limited. They agreed that implementation of a food defense management plan would be effective to address food terrorism issue in their operations. They were highly motivated to protect the operation from an attack and to avoid the risk of terrorism and intended to implement a plan in their operation.

Keywords: food terrorism, food defense, food defense management plan, implementation intention, protection motivation theory, approach-avoidance motivation

Introduction

Food safety efforts in the U. S. have mainly focused on accidental contamination of food and water. However, threats to the food and water supply can arise from several sources: (1) disasters, (2) food ingredients (allergens, genetically modified organisms, imported food, etc.), or (3) human behaviors related to food safety/sanitation. Of the three, food ingredient issues and food safety/sanitation are relatively well controlled and monitored by different government agencies. Foodservice operations have developed procedures to control or limit risks associated with food and water contamination. However, the foodservice industry and the U. S. government are not well prepared for threats related to disasters, whether the disaster is intentional (terrorism) or natural (hurricane, fire, flood) (Bledsoe & Rasco, 2002; Bryant, McEntire, & Newsome, 2005; Hollingsworth, 2002; Stauffer, 2002; White, 2002). Disaster management plans include crisis management plans and evacuation plans at the local, state, and federal levels. However, most of these plans have focused on naturally occurring disasters, not disasters caused by deliberate sabotage, and have emphasized reactions to those disasters, and strategies to minimize their effects. Intentional disasters, however, can be prevented if an effective plan is implemented. Today foodservice professionals and dietetics practitioners are strongly urged to implement customized management plans to protect their customers, clients, and employees from potential acts of intentional food contamination (United States Department of Agriculture [USDA], 2003; Bledsoe & Rasco, 2002; Bruemmer, 2003; Peregrin, 2002). Although specific acts of food adulteration have not been reported often in either retail or institutional foodservice, the possibility that someone could intentionally contaminate foods and beverages served in these operations should not be ignored (Bledsoe & Rasco, 2002; White, 2002).

Various government agencies and industries are actively involved in the formation of effective defense mechanisms (Meyerson & Reaser, 2002). However, uncertainty and lack of information about risk will increase fear associated with food terrorism. Increasing the level of awareness is one of the five major strategies the Food and Drug Administration (FDA) adopted for counterterrorism (Meadows, 2004). However, no study has investigated foodservice directors' awareness of food terrorism attack risks that they may be facing and how likely the foodservice directors are to develop and implement a voluntary food defense management plan. The FDA tries to minimize the risk with the registration and detention rule under the

Bioterrorism Act. However, this law does not regulate restaurants and on-site foodservice operations (the Bioterrorism Act of 2002).

Gaps exist in research about food terrorism concerns, the level of preparedness in the foodservice industry and how to effectively decrease the risks. Although the government recommends foodservice operations have a food defense management plan, the willingness to implement such a plan has not yet been investigated. Because a food defense management plan is not mandatory but voluntary, it is extremely important to reveal directors' intention to develop and implement a food defense management plan and to encourage them to follow these government recommendations. The primary purpose of this study was to investigate the perceptions that on-site foodservice directors possess towards the intentional food contamination and implementation of a food defense management plan. This research should reveal how to effectively increase the foodservice directors' intention to implement a food defense management plan in their operations.

Food Defense

Approximately 20,000 terrorism events and 7,400 adverse events, both involving more than one victim, were recorded worldwide from 1968 to 2004 (Bogen & Jones, 2006). Among the 87,000 injuries, 25,400 were fatal. Even though the Sept. 11, 2001 incidents skewed this trend significantly, an upward trend was detected for a number of events, injuries, and deaths in the Bogen and Jones study. The projection model developed by Bogen and Jones (2006) anticipates that these numbers will continue to increase.

Bombings have been the most frequently used terrorist method (Federal Emergency Management Agency [FEMA] 2005; McGlown 2004). FEMA noted that the U. S. has been more cautious about terrorist attacks involving biological or chemical agents since the anthrax cases in 2001. Some of these agents can have an immediate effect and are odorless and tasteless. Because some of these agents are difficult to detect with current technologies, the possibility of terrorists developing and using biological or chemical agents to contaminate the food or water supply system is very high (Hall et al., 2004; FEMA, 2005).

Since 2001, international organizations, as well as the U.S. agencies, have dramatically increased their efforts to deal with bioterrorism by defining it and enlightening the public. According to the USDA, bioterrorism is "the intentional use of biological and chemical agents

for the purpose of causing harm” (USDA, 2003). The World Health Organization (WHO) defines food terrorism as “an act of threat of deliberate contamination of food for human consumption with chemical, biological or radionuclear agents for the purpose of causing injury or death to civilian populations and/or disrupting social, economic or political stability” (WHO, 2002). Based on this definition, terrorism does not have to be related to any political or religious pursuits or enemies from outside of the nation. Food terrorism or food bioterrorism, as used hereafter in this study, means the malicious intentional contamination or adulteration of food with these biological or chemical agents.

Consequences of Terrorist Attack

Bruemmer (2003) identified the consequences of a compromised food supply in four different areas: physical, psychological, political, and economic. Besides an insufficient food supply (physical), morbidity and mortality caused by a bioterrorism attack would lead to psychological consequences, such as discomfort and fear (Bruemmer, 2003; Hall et al., 2004). Disorders such as depression, generalized anxiety, and panic may develop among direct victims and lead to increased consumption of alcohol, nicotine, and other substances. Family conflict and domestic violence may also rise (Hall et al., 2004). In the broader scope, most people in society will experience some degree of psychological distress following a disaster or terrorism event. Their responses can include decreased confidence in their safety, less travel, concentration disruption, sadness, and anger. According to Krueger and Maleckova (2002), the definitions of terrorism used in academia place more emphasis on the intention of terrorists to cause fear and terror among a targeted population than is experienced by the direct victims of the terrorist attack. The direct victim of the terrorism is thus not the main target of the terrorism act. Following a terrorism act, the public’s confidence in government’s ability to protect them would decrease significantly.

Estimation of Economic Impact of Food Terrorism

Economic impact is another very significant effect of a terrorism attack (Bruemmer, 2003; Hall et al., 2004). The magnitude of the economic impact can be easily estimated from the previous foodborne illness outbreaks. Foodborne disease is extremely costly. According to the National Institutes of Health (NIH), the annual cost of all foodborne diseases in the United States is \$5 to \$6 billion in direct medical expenses and lost productivity (NIH, 2005). USDA’s

Economic Research Service estimated the annual expenditures for illnesses caused by five pathogens: *Campylobacter* (all serotypes), *Salmonella* (nontyphoidal), *E. coli* O157, *E. coli* non-O157 STEC, and *Listeria monocytogenes*. The two most costly foodborne illness pathogens are *Salmonella* and *Listeria monocytogenes*. Based on updated data from Economic Research Service (2004), the cost of *Salmonella* accounted for an estimated \$3 billion. Beside the monetary losses from illness, the level of consumer trust in the food industry, as a whole, decreases after significant foodborne illness outbreaks.

Activities of Government Agencies and the Industry

Several governmental agencies are involved in combating bioterrorism threats. For the Fiscal Year (FY) 2008, the U.S. government allocated \$4.3 billion for the terrorisms preparedness (HHS, n.d.). This is 78% of total budget allocation for the Emergency Preparedness. According to the HHS (n.d.), the National Institutes of Health has a budget of \$1.7 billion for FY 2008 to spend on biodefense research which supports the nation's ability to detect and counter bioterrorism and \$96 million on research for developing medical countermeasures against nuclear, radiological, and chemical threats. The Centers for Disease Control and Prevention (CDC) conduct activities on 'Strategic National Stockpile' (\$581 million), critical surveillance systems (e.g, BioSense) (\$88 million), upgrading state and local preparedness effort (\$698 million), and upgrading CDC capacity (\$137). FDA also plays an important role in terrorism preparedness under the Bioterrorism Act of 2002. In fact, the retail food sector is more closely related to this agency's activities than any other government agencies because the FDA is responsible for regulating the safety of 80% of the U.S. food supply. The FDA provides regulatory review of medical products, inspects domestic food manufacturers, and enhances food import inspections to protect the nation's food supply and prevent foodborne illness. The FDA received \$5 million for activities related to bioterrorism in 2001. In FY 2007, the FDA is spending \$242 million (\$178 million for food defense, \$57 million for vaccines/drugs/diagnostics, and \$7 million for physical security) and proposed the same amount to protect the food supply against bioterrorism for FY 2008 (HHS, n.d.).

FDA initiated ALERT to raise the awareness regarding food defense issues among the state and local government agency and industry representatives (FDA, 2006). ALERT is an acronym of Assure, Look, Employees, Reports, and Threat. FDA suggested that the industries

and businesses use these five key points to decrease the risk of intentional food contamination at their facilities. FDA is providing ALERT brochures and wallet cards in five different languages: English, Chinese, Korean, Spanish, and Vietnamese, and posters in two different languages: English and Spanish along with a web-based ALERT training. These ALERT materials explain how to (1) assure that the supplies and ingredients are from a safe and secure source; (2) look after the security of the products and ingredients; (3) get to know employees and people coming in and out of the facility; (4) prepare reports about security of products while under their control; (5) respond to a threat or a suspicious behavior (FDA, 2006).

Another food defense activity that FDA is highly involved in is called CARVER + Shock (FDA, June 14, 2007). The Strategic Partnership Program Agroterrorism (SPPA) Initiative is a joint effort of the Federal Bureau of Investigation (FBI), Department of Homeland Security (DHS), USDA and FDA to help secure the nation's food supply. Through the SPPA Initiative, CARVER + Shock was developed and modified based on a series of site visits since 2005. CARVER + Shock is a vulnerability assessment tool adapted from the military version CARVER for use in the food industry. Conducting traditional CARVER + Shock assessment involves several different government agencies; FDA, USDA, FBI, local or/and state agencies, etc. FDA has developed and distributed the software that enables the user to identify where an attack is most likely to occur and, therefore, to focus resources on protecting the most susceptible points in their system. CARVER is an acronym for Criticality (measure of public health and economic impacts of an attack) , Accessibility (ability to physically access and egress from target), Recuperability (ability of system to recover from an attack), Vulnerability (ease of direct loss from an attack as measured by loss in production), Effect (amount of direct loss from an attack as measured by loss in production), and Recognizability (ease of identifying target) which are used to evaluate the attractiveness of a target for attack while Shock assesses the combined health, economic and psychological impacts of an attack within the food industry. FDA is also providing several food defense related training videos and other materials on its websites.

USDA has published several different guidelines targeting different audiences; FSIS Security Guideline for Food Processors (<http://www.fsis.usda.gov/PDF/Securityguide.pdf>), FSIS Security Guideline Keep America's Food Safe (http://www.fsis.usda.gov/PDF/Keep_Americas_Food_Safe.pdf), FSIS Safety and Security Guidelines for the Transportation and Distribution of Meat, Poultry, and Egg Products

(<http://www.fsis.usda.gov/OA/topics/transportguide.pdf>). The Food and Nutrition Service of the USDA also published a biosecurity checklist guideline for school foodservice programs (<http://healthymeals.nal.usda.gov/hsmrs/biosecurity.pdf>) to help school foodservice directors strengthen the safety and security of their operations to protect not only children but also adults in the system (USDA, 2003). While these guidelines are not mandatory, the Food and Nutrition Service strongly recommends that the school community develop a biosecurity management plan. Other than this checklist for school foodservice, some resources are available for retail and institution foodservice managers who plan to develop and implement a management plan (e.g., White, 2002; Gerald & Perkin, 2003; Center for Food Safety and Applied Nutrition, 2003).

Organizations affiliated with the food industry have also developed guidelines for internal and external use. The American Institute of Baking (AIB) International published “The AIB International Guide To Food Defense For Food Retail and Food Service Operations” in 2006. This non-profit corporation, founded by the North American wholesale and retail baking industries, published the guideline to train their students and others who are interested in food defense issues. AIB International also provides off-line and on-line seminars to food industry professionals. The guidelines explain the food defense program, why it is important, what security measures are needed, and how to develop and implement a food defense program. In the guidebook, food terrorism threats can be divided into two categories: internal and external. Attackers are categorized into five types: criminals, protesters, terrorists, subversives, and rogue or disgruntled insiders. Internal threat is related to employees and vendors who have access to the facility while external threat refers to threats caused by outside attackers who do not have facility access. Even though internal threats are more common, external threats should not be neglected because different approaches are needed to prevent attacks.

Research on bioterrorism and preparing for attacks in the foodservice industry is still incomplete. Yoon and Shanklin (2007a; 2007b) conducted a pilot study that investigated a foodservice operation’s level of preparation for food terrorism. They explored the level of preparedness against food terrorism attack in on-site foodservice operations in Kansas. The results of the study showed that practices related to chemical use and storage and food handling were most frequently implemented while securing the facility and communicating with local authorities and suppliers were least frequently implemented. The results also showed that when respondents perceived items to be more important, they were practiced more frequently. The

foodservice directors in healthcare facilities perceived all practice categories as important and practiced them more frequently than school foodservice directors. Assigning a person to be responsible for biosecurity practices and to attend seminars on food biosecurity significantly increased the frequency of biosecurity practices. In Yoon and Shanklin's study (2007a; 2007b), food biosecurity preventive measures appear to be related to the perceptions of foodservice directors. Yoon and Shanklin proposed that the use of material safety data sheets might guide foodservice operations to perform preventive measures automatically. If this is true, a well-prepared and detailed food defense management plan should work effectively because this management plan is "a written document that spells out policies and procedures that minimize the risk of intentional contamination of food and reduce the risk of illness or death" (USDA, 2003, p1).

In addition, consumer perception about the risk associated with food supply in the U.S. was investigated by Spillman (2003). Spillman found that older individuals with less education and middle-aged adults with post-baccalaureate education perceived more risks of a bioterrorism attack in the food supply system in the U. S. Most responded that 'contamination by poison', 'microorganisms', or 'water polluted by nuclear waste' could be the most significant threat to the food supply.

The results of the Yoon and Shanklin study (2007a; 2007b) and Spillman's study (2003) provide an important starting point to improve biosecurity in the foodservice industry. Foodservice directors need to take a more active role in securing the food supply. Implementing a food biosecurity management plan in an operation will be costly and time consuming; however, doing so is essential if operations are to protect customers, clients, and their employees. Even though reported bioterrorism attacks are rare in the foodservice industry, foodservice operations should be prepared for such threats.

Protection Motivation Theory (PMT)

In order to encourage foodservice directors to implement a food defense management plan, an effective communication strategy is critical. Many disease prevention or healthy lifestyle promotions use fear appeals to promote behavioral change among the message recipients. Fear appeals are very useful, especially when the message receivers perceive the consequences are severe and the probability that the event will occur is high. However, frustrated message

receivers may try to reduce the aroused fear by discrediting or ignoring the threatening information if no effective solution follows. One of the popular theories on health promotion campaigns is the protection motivation theory.

The protection motivation theory (PMT) was first developed by Rogers (1975, 1983) to explain the relationship between feeling fear and health behavior change. According to PMT, when an individual faces a threat, the four major cognitive appraisal processes mediate the choice of a coping behavior. These five processes appraise the information available about the perceived severity of the threat, the perceived probability that the threat will occur (vulnerability), the perceived ability of a coping behavior to remove the threat (response efficacy), the perceived barrier to perform the coping behavior (response cost) and the individual's perceived ability to carry out the coping behavior (self-efficacy). The outcome of these appraisal processes is an intermediate state called "protection motivation" (Rogers, 1983). These five processes can be divided into two different appraisal phases: threat appraisal for the first two and coping appraisal for the other three. The detailed information about how these different constructs of PMT could measure foodservice director's food terrorism risk perception and implementation intention is included in the Methodology section.

Methodology

Survey Instrument Development

A cross-sectional study was conducted to test the hypotheses. Quasi-experimental research design was used to test whether providing detailed information to the message recipients affects their perception about implementation of a food defense management plan. The sample was divided into two groups for the experiment: one group was provided with minimal information about the food defense management plan, and the other group was given detailed information about the plan. Measurement items were developed from two different sources: previous literature and interviews with experts and practitioners. Based on an extensive review of literature related to protection motivation theory and fear appeal persuasion, a questionnaire was first created to measure the foodservice directors' perceived effectiveness of a food defense management plan, their perceived ability to implement the plan, and their perception of the severity of and vulnerability to a food terrorism attack. Unlike previous PMT studies that did not measure the extent to which the message motivated the respondents to act, this study actually

measured the motivation using approach/avoidance motivation. PMT assumes that threat appraisal and coping appraisal create the motivation to follow the recommended behaviors, and this motivation is the intermediate state between the appraisal phase and the actual behavior phase (Rogers, 1975; 1983).

The ideal situation would allow the researcher to observe the participant's actual behavior. However, as is often the case with self-administered questionnaires, the survey assessed the respondents' intention to behave as a proxy for actual behavior. Many previous studies used behavioral intention instead of behavior (e.g. Abraham et al. 1994; Maddux & Rogers, 1983; Rippetoe & Rogers, 1987; Tanner et al, 1989). Among 27 PMT studies reviewed by Milne and others (2000), 22 measured intention, 10 measured concurrent behavior and seven studies measured subsequent behavior. Furthermore, results of the two different meta-analyses found that PMT components had larger effect size with behavioral intention than with behavior (Floyd et al., 2000; Milne et al., 2000). Since implementing the food defense management plan takes a long time, it would be impossible to confirm respondents' actual behavior in this cross sectional study. Therefore, this study obtained the respondents behavioral intention as an estimate of their actual future behavior

The questionnaire was reviewed by 15 evaluators to assess content validity and to assist in refining the research instrument. Food safety and security researchers in higher education institutions, local health department representatives, and foodservice directors evaluated the initial questionnaire using a semi-constructed evaluation form (Appendix D). Besides critiquing the questionnaire, they were also asked to select the most critical 10 practices from the lists of 35 defensive practices, which were used in the previous study (Yoon & Shanklin, 2007a; 2007b). Based on the feedback obtained from these experts, the questionnaire was modified and then pilot tested in February 2007 with 200 foodservice directors. The purpose of the pilot test was to detect measurement errors and to assess the reliability of multiple measurements and construct validity (convergent and discriminant) of the questionnaire. The response rate (11%) for this pilot test was too low to accurately appraise the reliability and construct validity. Since the Cronbach's alpha for all PMT components were higher than 0.8, it was decided that the measurement items were reliable to a certain extent.

The final questionnaire consisted of five sections. The section A contained information about a food defense management plan. The amount of information released to the respondents

was differentiated so that perceived effectiveness (efficacy) of the food defense management plan would be higher for the study participants who received more detailed information than participants who received less detailed information. The long version of the section A contained 504 words while the short version had 272 words. The information included in this section was adopted from published guidelines (USDA, 2003; Leeve et al, 2003; FDA 2003). Several true/false questions were inserted after the explanation of the food defense management plan to determine if the participant actually read the explanation. These true/false items were directly derived from the content of the explanation. Foodservice directors from 550 healthcare operations and 550 school districts received the more detailed version of the food defense management plan description. Another 550 healthcare operations and 550 school districts received the shorter version of section A.

Section A defined a food defense management plan and then elucidated various types of attackers. A simple one-sentence explanation of how a food defense management plan works was provided. The following one sentence description was included. “A food defense management plan identifies possible attackers and agents and describes practical security measures that should be implemented”. The detailed form of Section A explained the steps in developing and implementing a food defense management plan, described who should be included on the management team, and how to audit the facility. Additional resources that would help the foodservice directors understand a food defense management plan and develop and implement such a plan was included in a subsequent paragraph.

Perceptions about food terrorism and food defense management plan and motivation and intention to implement a food defense management plan were measured in Section B and C, respectively. PMT variables were measured in this section of the survey questionnaire. All items in these sections were measured using 7-point Likert type scales except for attitude scales which were measured on a bi-polar attitudinal scale from -3 to 3. In order to capture more accurate responses, three or more measurement items were included for each construct. Development of these items is described below.

Threat appraisal is a cognitive evaluation of risk perception. Vulnerability assesses how personally susceptible an individual feels to the communicated threat. Severity perception measures an individual’s belief about the seriousness of the consequences of the threatening event. In empirical studies, these variables have been measured using Likert type scales that

requested study participants to check their level of agreement with several statements (e.g., Block & Keller, 1995; Brown, 2005; Campis, Prentice-Dunn, & Lyman, 1989; Kals & Montada, 2001; Rhodes & Plotnikoff, 2005; Ronis & Harel, 1998; Melamed et al., 1996; Umeh, 2005; Witt et al., 1998;) or their level of agreement that the statements were true (e.g., Aspinwall et al., 1991; Axelrod & Newton, 1991; Ho, 1998; Kulik & Mahler, 1987; Mcmath & Prentice-Dunn, 2005). The scales in these studies ranged from 4 to 15. A few other studies used a bipolar scale or a semantic differential scale (e.g., Hartenian, Bobko, & Berger, 1993; Kantola, Syme, & Nesdale, 1983)

This study measured perceived severity of and perceived vulnerability to intentional food contamination. The perceived risk of intentional food contamination at a foodservice director's own facility should be the major focus of the measurement items. However, their perception of terrorism in the food supply chain in the U. S. should not be neglected. Unrealistic optimism could possibly affect their answers. For example, even though foodservice directors may feel that every component of the food supply chain is at high risk, they may feel their own facilities face minimal risk. Unrealistic optimism refers to the phenomenon that people systematically overestimate the probability that good things will happen to them and underestimate the probability that bad things will happen to them (Weinstein, 1987). Thus, study participants' severity and vulnerability perception of both their own facilities and industry as a whole were assessed to determine whether they possess unrealistic optimism. The following item was used to measure the perceived vulnerability of the U.S. food chain, "the food supply chain in the U.S. is at risk of a terrorist attack while "it is likely that someone will attack my operation" assesses the perceived vulnerability specific to the participant's own facility.

Even though the original PMT model assumes that the fear is aroused without assessing it directly, the affective appraisal of risk communication, the fear, adds precision to the study (Tanner, Hunt, & Eppright, 1991). Therefore, the level of fear, the emotional evaluation of the threat, was gauged using terms such as frightening, fearful, anxiety, and nervous.

The coping-appraisal process evaluates the ability to cope with or prevent the threatening event. Factors comprising the coping-appraisal process are efficacy variables and response costs. Response efficacy is the belief that the adaptive response will work. In other words, it is an individual's belief that taking protective action will be effective in protecting self or others. Self-efficacy is the perceived ability of the person to initiate the adaptive response. Response costs are

any costs (monetary, personal, time, effort) associated with implementing the adaptive coping response.

Since the protective behavior is performed by the foodservice director on behalf of the organization and not based on their response as an individual, the efficacy should be measured accordingly. For example, foodservice directors may perceive that they have the ability to implement a food security management plan; however, when organizational factors are considered, the foodservice directors' perception of their ability may change. Measuring the self-efficacy level of a foodservice director, who is the decision maker, in implementing a food defense plan is necessary but not enough to predict the operation's actual behavior change. Therefore, the present study included items measuring not only foodservice directors' own self-efficacy perception (Self-efficacy: I am able to implement a food defense management plan in my operation.) but also their perception related to an operations' ability to implement the food defense management plan (Organizational efficacy: My operation is able to implement a food defense management plan.).

Even though the main purpose of this study was to explore how likely foodservice operations are to implement a food defense management plan (protection motivation or danger control), measurement items for investigation of maladaptive response were added to assist the researcher in identifying a thorough understanding of the phenomenon.

Attitudes towards the food terrorism and a food defense management plan were additionally measured using bipolar semantic differential scale (Witte et al., 1998). The study participants were asked to fill in the blank for statements by checking numbers in each item that best represented their thoughts. Participants' attitudes towards food terrorism were measured using the following statement: "When I heard about food terrorism, my first instinct was to _____." The response options for this item were 'not want to think about it or want to think about it' and 'not want to do something extra to deal with it or want to do something to protect the operation.' This statement was modified from the study conducted by Witte et al., (1998) to check the defensive avoidance, a type of fear control response. Attitude towards a food defense management plan was measured to check the manipulation of the response efficacy using the statement, "I think a food defense management plan is (ineffective-effective; bad-good; undesirable-desirable; and useless-helpful) for addressing food terrorism in a foodservice operation."

Items measuring the motivation were adopted from approach-avoidance motivation concept. Approach motivation is distinguished from the avoidance motivation. Approach motivations are directed towards desirable outcomes while avoidance motivations are directed away from undesirable outcomes (Lieberman, 2003). Elliot (2006) contended that the approach-avoidance distinction was used over 2000 years. He defined approach motivation as “the energization of behavior by, or the direction of behavior toward, positive stimuli (objects, events, possibilities)” and avoidance motivation as “energization of behavior by, or the direction of behavior away from, negative stimuli (objects, events, possibilities) (Elliot, 2006 p.112). In this study, approach motivation was used to evaluate how much the respondents wanted to protect their operations (e.g. I want to protect my customers from harmful events) while avoidance motivation was used to evaluate how much they want to stay away from the terrorism risk (e.g. I want to reduce a food terrorism risk as much as possible). Since the study measured the construct related to the approach-avoidance concept, this study was expected to measure different dimensions of the motivation.

Since some operations may have already implemented such a plan or had been developing such a plan prior to the study, the questionnaire included screening questions to identify these operations. These questions used a dichotomous scale. In the first screening question, the study participants were asked whether they have already implemented a food defense management plan. If the respondents had not implemented a plan, the respondents were asked whether their operation was in a developing stage for a food defense management plan. If the respondents indicated that they were not currently developing a food defense management plan, they were asked to disclose their level of intention to develop and implement a plan in the future.

Based on the feedback received from the 15 experts, twelve items were selected and listed in the Section D of the questionnaire to assess the operation’s frequency of implementing current defensive practices. Findings from a meta-analysis performed by Milne et al. (2000) showed that all PMT variables were significantly correlated with concurrent behavior. Among the variables, the intention had the largest association with concurrent behavior. Therefore, inspection of current behavior adds precision to the study results.

Socio-demographic information was obtained (Section E). These items were included to obtain information specific about respondents’ operations. Items related to the size of the

operation (number of beds or students, number of meals served, budget, and FTE/maximum employees per shift), type of the operation (self-operated vs. outside contractor), employees with food safety responsibility and employees with food defense, facility auditing, and existence of a crisis management plan. Socio-demographic variables about the respondent included position title, years in the current position, years in foodservice industry, professional credential (RD), age, gender, education level, and training related to food defense.

Study Samples and Data Collection

The population of the study was foodservice directors in both acute healthcare and school districts in the U. S. Sampling for the healthcare foodservice directors was performed among members of Healthcare Foodservice Management (HFM) and American Society for Healthcare Foodservice Administrators (ASHFSA). A mailing list of 1,232 school foodservice directors in districts with enrollment ≥ 7500 was purchased in May 2006 from the Market Data Retrieval (MDR). A sample of 1,100 healthcare foodservice directors and 1,100 school foodservice directors were randomly selected from these sampling pools. Half of the sample in both groups received questionnaires with detailed section A and the other half received it with a simpler section A.

In accordance with the requirements of the KSU Institutional Review Board (IRB), the investigator completed the training and education modules designed for studies involving human subjects and then obtained IRB's approval of the study before the pilot test. The questionnaire, a cover letter that explained the nature and purpose of the study, a supporting letter from a professional organization, a postage-paid return envelope, and a complimentary result request card were mailed first class to a sample of 2,200 foodservice directors during the second week of March in 2007. Letters from the presidents of the School Nutrition Association and the Healthcare Foodservice Management were added to highlight the contribution of the study to the organizations and the foodservice industry. As an incentive to encourage response, participants were offered a summary of the results. Respondents desiring a summary were asked to return the enclosed request card. In addition, a two dollar donation to a choice of association scholarship funds: School Nutrition Association (SNA), Healthcare Foodservice Management (HFM), and American Society for Healthcare Foodservice Administrators (ASHFSA); the March of Dime, or

the National Breast Cancer Foundation was offered to encourage participation. Four weeks after the initial questionnaire was mailed, a reminder post card was sent to non-respondents.

Twenty-five questionnaires were returned as undeliverable, 16 from the healthcare and 9 from the school. A total of 449 usable questionnaires were received at the beginning of May 2007. School foodservice directors had higher response rate ($n=254$; 23.28%) than healthcare foodservice directors ($n=195$; 17.99%). Numbers of respondents from each state are presented in the Appendix F.

Data Analyses and Results

SPSS version 13 for Windows (2004, SPSS Inc., Chicago, IL) was used to address research questions and to determine the overall characteristics of respondents and operations. Frequencies, means, and standard deviations were calculated. In addition, statistical analyses were used to compare characteristics of foodservice directors in schools and healthcare operations. Chi-square analyses were conducted for group comparisons for categorical variables, and t-tests were performed for continuous variables.

The entire data entry was verified after the data was entered by two different individuals before analyzing the data. Before performing actual data analyses, however, sets of independent t-tests among key variables were performed. Results were not statistically different between initial and after reminder responses. Levene's tests for equality variances in two groups for all tested variables also were not significant at α level of 0.05. Variances for the key variables in initial and the follow-up responses were statistically the same. Because no significant differences were found between the two groups, the data were combined for analyses without any restrictions.

The result of the manipulation check revealed that the response efficacy perception was not differentiated by the amount of information provided about the food defense management plan. T-test results for the all four attitude questions about a plan were not statistically significant (range of t statistics: 0.572 ~ 1.528). Therefore, the responses collected from the participants who filled out the questionnaire with detailed section A and with simpler section A were combined for further data analyses.

Profiles of respondents/operations in hospitals and schools

Table 4-1 illustrates the characteristics of respondents and the operations. The age of the respondents ranged from 27 to 71 with a mean age of 50.46. A majority of the respondents had bachelor's degrees or higher (87.9%). The survey respondents were predominantly female (71.5%). Significantly more foodservice directors employed in healthcare operations were male ($\chi^2 = 9.175$, $p = 0.002$). Among the study participants, more than a half of the foodservice directors in healthcare foodservice were registered dietitians (57.4%) compared to 31.9% of the school foodservice directors ($\chi^2 = 29.239$, $p = 0.000$). Only 23.2% of respondents had attended a seminar or training related to food defense. This is more than two times the number of directors in a previous study conducted in 2005 in Kansas (Yoon & Shanklin, 2007a; 2007b). A possible explanation of this increase is that more food bioterrorism seminar/training opportunities are available since the 2005 study. Many respondents specified that they had attended one or more seminar/training sessions between 2005 and 2007. Years of experience in foodservice ranged from 0 to 55 years with a mean of 24.06 years. Years in the current position ranged from 0.1 to 38 with a mean of 10.06 years.

The majority (94.2%) of the facilities were independently operated. The majority (77.7%) of the operations had one or more designated employees who were responsible for food safety. However, only 31.0% of the operations had one or more employees whose responsibility was to implement or monitor food defense practices. This percentage was increased slightly since the 2005 study by Yoon & Shanklin (2007a; 2007b) who reported 26.3% of operations had employees with these responsibilities. The majority of the operations had some type of crisis management plan (81.5%). Healthcare foodservice operations were more likely to have a well documented crisis management plan (72.3%) than school foodservice operations (55.9%). Many operations (76.8%) did not audit their facilities to check how well secured their operations were against possible food adulteration. Among the audited operations, the auditing process was performed most frequently by the operation itself (68.1%) rather than by governmental agencies (22.3%) or third party agencies (9.6%).

Table 4.1 Demographic Profile of Healthcare and School Foodservice Directors

	Total (N = 449) ^a	Hospitals (N = 195) ^a	Schools (N = 254) ^a		
	freq. (%)	freq. (%)	freq. (%)	χ^2	Sig.
Gender				9.175	0.002
Male	120 (26.7)	66 (33.8)	54 (21.3)		
Female	321 (71.5)	125 (64.1)	196 (77.2)		
Education				2.486	0.779
High school	5 (1.1)	1 (0.5)	4 (1.6)		
Vocational school	4 (0.9)	1 (0.5)	3 (1.2)		
Some college	41 (9.1)	17 (8.7)	24 (9.4)		
Bachelor's degree	121 (26.9)	50 (25.6)	71 (28.0)		
Some graduate	74 (16.5)	34 (17.4)	40 (15.7)		
Graduate	200 (44.5)	91 (46.7)	109 (42.9)		
RD				29.239	0.000
Yes	193 (43.0)	112 (57.4)	81 (31.9)		
No	253 (56.3)	82 (42.1)	171 (67.3)		
Seminar/Training				3.231	0.072
Yes	104 (23.2)	37 (19.0)	67 (26.4)		
No	338 (75.3)	154 (79.0)	184 (72.4)		
Type of Operation				3.281	.194
Self Operation	423 (94.2)	188 (96.4)	235 (92.5)		
Outside Contractor	22 (4.9)	6 (3.1)	16 (6.3)		
Employee for Food Safety				0.028	0.867
Yes	349 (77.7)	150 (76.9)	199 (78.3)		
No	91 (20.3)	40 (20.5)	51 (20.1)		
Employee for Food Defense				0.101	0.751
Yes	139 (31.0)	59 (30.3)	80 (32.7)		
No	295 (65.7)	130 (66.7)	165 (67.3)		
Crisis Management Plan				16.344	0.000
Yes, well documented	283 (63.0)	141 (72.3)	142 (55.9)		
Yes, not well documented	83 (18.5)	22 (11.3)	61 (24.0)		
No	71 (15.8)	25 (12.8)	46 (18.1)		
Food Defense Auditing				2.298	0.681
Yes, 3rd party	9 (2.0)	3 (1.5)	6 (2.4)		
Yes, government	21 (4.7)	9 (4.6)	12 (4.7)		
Yes, internal	64 (14.3)	32 (16.4)	32 (12.6)		
No	345 (76.8)	148 (75.9)	197 (77.6)		

^a. Valid responses only are included, thus the variability in number of responses

The size of operations varied significantly between the foodservice operations in the school districts and the healthcares. The healthcare foodservice operations were smaller than school foodservices. The smallest school foodservice operation served 2700 meals per day which was 67.5 times the number of meals that the smallest healthcare foodservice operation served

daily. Likewise, the annual operating budget for the smallest healthcare foodservice operation was 13.7% of the annual budget for the smallest school foodservice operation. Based on the variations between the minimum and the maximum numbers of meals served and the annual operating budget within each type of foodservice operation, the size of healthcare foodservice operations varied more than the size of school foodservice operations participated in this study. However, the number of full time equivalent employees varied more in school. The large variations may be due to either the different sampling frames for both types of operations or for response error, the size measure decided not included in further analyses.

Threat Appraisal

Survey respondents perceived that the impact of an intentional food contamination would be serious (Table 4-2). They perceived food terrorism as a serious threat in the U.S. (5.59 ± 1.28); they thought that if intentional food contamination occurred in their own operations, it would have very serious impact on their businesses ($5.87 \pm 1.21 \sim 6.61 \pm 0.80$). School foodservice directors more strongly believed that it would take years to recover from the attack than healthcare foodservice directors ($t = 2.7, p = 0.01$).

In terms of the vulnerability perception, study participants agreed that the food supply chain in the U.S. is at risk of a terrorist attack (5.61 ± 1.12). The respondents do not strongly believe that the food industries are at higher risk of attack than other industries (4.54 ± 1.34) and that a foodservice operation is likely to be a target of the attack (4.55 ± 1.25). Although they somewhat agreed that they were concerned about the intentional contamination of food in their operations (5.05 ± 1.37), they tended to somewhat disagree to the statement, 'It is likely that someone will attack my operation' (3.31 ± 1.22). The respondents were fearful about a food terrorism attack. The level of the fear was greater when they responded to specific items related to their own operations than when asked to rate their fear of food terrorism (Table 4-2).

Table 4.2 Mean Comparisons for Threat Appraisal Between Healthcare and School Foodservice Directors

	Total	Healthcares	Schools		
	(n=449)	(n=195)	(n=254)		
	Mean±SD	Mean±SD	Mean±SD	t	p
Severity	6.10±0.72	6.04±0.72	6.14±0.71	1.54	0.12
Food terrorism is a serious threat in the U. S.	5.59±1.28	5.22±1.31	5.35±1.26	1.12	0.26
If someone intentionally contaminates food in my operation, my employees or customers will suffer from the attack.	6.63±0.71	6.68±0.61	6.59±0.78	1.31	0.19
If someone intentionally contaminates food in my operation, it will damage the reputation of my facility.	6.61±0.80	6.57±0.85	6.63±0.76	0.84	0.40
If someone intentionally contaminates food in my operation, it will take years for my operation to recover from the attack.	5.87±1.21	5.69±1.32	6.01±1.11	2.7	0.01
Vulnerability	4.61±0.96	4.54±0.94	4.67±0.97	1.35	0.18
I am concerned about the intentional contamination of food in my operation.	5.05±1.37	4.98±1.36	5.11±1.37	0.93	0.35
The food supply chain in the U. S. is at risk of a terrorist attack.	5.61±1.12	5.66±1.13	5.57±1.12	0.81	0.42
Industries related to the food supply chain in the U. S. are at higher risk of terrorist attack than other industries.	4.54±1.34	4.41±1.33	4.64±1.35	1.8	0.07
It is likely that someone will attack a foodservice operation.	4.55±1.25	4.46±1.34	4.63±1.18	1.43	0.15
It is likely that someone will attack my operation.	3.31±1.22	3.20±1.19	3.39±1.23	1.64	0.10
Fear	6.28±0.84	6.25±0.79	6.30±0.88	0.60	0.55
Food terrorism is frightening.	6.00±1.22	5.94±1.26	6.06±1.19	1.00	0.32
A food terrorism incident in my operation would create fear.	6.45±0.82	6.45±0.75	6.44±0.87	0.16	0.87
A food terrorism incident in my operation would cause anxiety.	6.47±0.82	6.49±0.73	6.46±0.88	0.39	0.69
I would be frightened if a food terrorism incident occurred in my operation.	6.20±1.14	6.14±1.14	6.25±1.13	1.01	0.31
I would be nervous if a food terrorism act occurred in my operation.	6.26±1.08	6.23±1.08	6.28±1.09	0.42	0.67

Note. Scale = 1: strongly disagree; 2: Disagree; 3: somewhat disagree; 4: neither agree nor disagree; 5: somewhat agree; 6: agree; 7: strongly agree

On the bipolar scale (-3 ~ 3), when the respondents heard about food terrorism, their first instincts were more likely to ‘want to think about it’ (1.18 ± 1.54), ‘want to know more about it’ (1.76 ± 1.33), and ‘want to do something to protect the operation’ (1.51 ± 1.46) rather than ‘not want to think about it’, ‘not want to know more about it’, and ‘not want to do something to protect the operation’ ($t = 16.10, p = 0.00; t = 27.78, p = 0.00; t = 21.73, p = 0.00$, respectively when the test values were 0). Attitudes towards food terrorism were not different between the school foodservice directors and healthcare foodservice directors.

Coping Appraisal

Overall respondents perceived that implementation of a food defense management plan would be effective to address the food terrorism issues in foodservice operations (5.73 ± 0.92) (Table 4-3). Respondents indicated implementing a food defense management plan would be somewhat time consuming (4.89 ± 1.44). They somewhat disagreed that additional employees would be required (3.36 ± 1.50) and that it would be costly to implement a food defense plan (3.87 ± 1.49). School foodservice directors were more likely to perceive that the implementation process would disturb routine work ($t = 2.01, p = 0.04$) and be costly ($t = 2.09, p = 0.04$) than hospital foodservice directors.

The study participants perceived moderate level of self efficacy and operational efficacy for the implementation a food terrorism management plan. They somewhat agreed that they and their operations are able to implement a food defense management plan (5.25 ± 1.17 and 5.19 ± 1.15 , respectively). Foodservice directors do not strongly regard a food defense management plan as difficult or complicated to implement (3.55 ± 1.31 and 3.47 ± 1.31 , respectively). They believed that agreement among the upper management team will affect the decision of whether they implement a food defense management plan or not (5.96 ± 1.04). Perceived operational efficacies related to employees were moderate. They indicated that employees in their operations would not resist much when they implement a new management plan (4.10 ± 1.53). They also responded that their employees are neutral to the operational changes (3.24 ± 1.46) and adopting a new policy or procedure (3.93 ± 1.41). Among these efficacy measurement items, school foodservice directors were slightly more likely to perceive that implementing a plan is difficult ($t = 1.99, p = 0.04$) and that employees would resist ($t = 2.19, p = 0.03$).

Motivation and Intention

As illustrated in Table 4-4, study participants revealed their strong motivation to avoid any food terrorism attack and protect their business from such an attack ($6.28 \pm 0.86 \sim 6.75 \pm 0.57$). Among the eight measurement items for approach motivation and avoidance motivation, hospital foodservice directors showed stronger motivation on two items: “I want to avoid any food terrorism danger in my operation” ($t = 2.24, p = 0.03$) and “I want to reduce a food terrorism risk as much as possible” ($t = 2.86, p = 0.00$). Additional items measuring motivation to seek the information on how to develop and implement a food defense management plan revealed that the foodservice directors want to have more detailed information about a food defense management plan (6.61 ± 1.02), to know how to develop and implement a food defense management plan (6.10 ± 1.01), and to participate in a food defense seminar or training (5.90 ± 1.18). In addition, they are willing to spend resources to implement a food defense management plan (5.49 ± 1.34). Healthcare foodservice directors more strongly agreed with all measurement items related to seeking other information except participate in seminar or training than the school foodservice directors ($t = 3.02, p = 0.00$; $t = 2.74, p = 0.00$; $t = 2.08, p = 0.04$, respectively).

Compared to their motivations, however, actual implementation intention was rated lower. The respondents somewhat agreed that they will implement a food defense management plan in their operations (5.44 ± 1.23) even though their approach motivation (6.53 ± 0.55) and avoidance motivation (6.54 ± 0.60) were very strong. Respondents from hospital foodservice operations had stronger intentions of implementing a food defense management plan than the school foodservice directors did ($t = 2.02, p = 0.04$).

Table 4.3 Mean Comparisons for Coping Appraisal Between Healthcare and School Foodservice Directors

	Total (n=449)	Healthcares (n=195)	Schools (n=254)		
	Mean±SD	Mean±SD	Mean±SD	t	p
Response Efficacy	5.73±0.92	5.75±0.96	5.72±0.88	0.29	0.78
Foodservice operations with a food defense management plan will have a lower probability of a food terrorist attack than operations without such a plan.	4.98±1.46	4.94±1.54	5.02±1.40	0.59	0.56
Foodservice operations with a food defense management plan will respond to a food terrorist attack more effectively than operations without such a plan.	5.97±1.00	6.01±1.05	5.94±0.96	0.69	0.49
Foodservice operations with a food defense management plan will respond to a food terrorist attack more promptly than operations without such a plan.	5.95±1.09	5.96±1.18	5.94±1.01	0.18	0.86
Implementation of a food defense management plan will help prepare operations to respond to a food terrorist attack.	6.02±0.94	6.07±0.98	5.98±0.90	0.92	0.36
Response Cost	3.93±1.22	3.80±1.22	4.02±1.21	1.91	0.06
Implementing a food defense management plan will disturb routine work.	3.58±1.59	3.41±1.59	3.71±1.58	2.01	0.04
Implementing a food defense management plan will require additional employees.	3.36±1.50	3.27±1.57	3.44±1.45	1.21	0.23
Implementing a food defense management plan will be costly.	3.87±1.49	3.71±1.55	4.00±1.43	2.09	0.04
Implementing a food defense management plan will be time consuming.	4.89±1.44	4.83±1.41	4.94±1.47	0.81	0.42
Self Efficacy	4.09±0.97	4.18±0.98	4.02±0.96	1.69	0.09
I am able to implement a food defense management plan in my operation.	5.25±1.17	5.30±1.15	5.20±1.19	0.9	0.37
Implementing a food defense management plan is difficult . ^a	3.55±1.31	3.69±1.32	3.44±1.30	1.99	0.04
Implementing a food defense management plan is complicated . ^a	3.47±1.31	3.54±1.26	3.42±1.36	0.93	0.36
Operational Efficacy	4.48±0.83	4.54±0.81	4.44±0.85	1.23	0.22
My operation is able to implement a food defense management plan.	5.19±1.15	5.19±1.14	5.18±1.15	0.07	0.94
Employees in my operation are likely to resist the implementation of a new management plan. ^a	4.10±1.53	4.28±1.55	3.96±1.51	2.19	0.03
Employees in my operation adopt a new policy or procedure easily.	3.93±1.41	3.88±1.45	3.97±1.39	0.68	0.50
Employees in my operation dislike operational changes. ^a	3.24±1.46	3.29±1.49	3.21±1.44	0.57	0.57
If upper management in my operation agrees to implement a food defense management plan, my operation will develop one.	5.96±1.04	6.05±1.03	5.89±1.04	1.59	0.11

Note. Scale = 1: strongly disagree; 2: Disagree; 3: somewhat disagree; 4: neither agree nor disagree; 5: somewhat agree; 6: agree; 7: strongly agree

^a. Reversed measures. The answers for these items were converted so that the higher number represent higher perception for the corresponding construct.

Table 4.4 Mean Comparisons for Motivation and Intention Between Healthcare and School Foodservice Directors

	Total	Healthcares	Schools		
	(n=449)	(n=195)	(n=254)		
	Mean±SD	Mean±SD	Mean±SD	t	p
Approach Motivation	6.53±0.55	6.57±0.51	6.50±0.58	1.19	0.24
I want to secure my operation.	6.28±0.86	6.33±0.84	6.25±0.88	0.97	0.33
I want to protect my employees from harmful events.	6.74±0.52	6.76±0.50	6.72±0.53	0.76	0.45
I want to protect my customers from harmful events.	6.75±0.57	6.76±0.50	6.74±0.63	0.49	0.63
I want my employees and customers to recognize that ensuring their safety is my operation's priority.	6.33±0.93	6.41±0.73	6.26±1.05	1.68	0.09
Avoidance Motivation	6.54±0.60	6.59±0.56	6.51±0.64	1.42	0.16
I want to avoid any food terrorism danger in my operation.	6.47±0.83	6.57±0.62	6.40±0.96	2.24	0.03
I want to reduce a food terrorism risk as much as possible.	6.55±0.88	6.69±0.64	6.45±1.00	2.86	0.00
I want to stay away from situations that could harm employees and customers.	6.55±0.69	6.55±0.71	6.54±0.67	0.17	0.86
I do not want anything bad to happen to my operation.	6.58±1.01	6.62±0.99	6.56±1.03	0.62	0.54
Information Seeking and Other Motivation	5.91±0.99	6.03±0.86	5.82±1.07	2.26	0.02
I want to have more information about a food defense management plan.	6.61±1.02	6.32±0.90	6.03±1.09	3.02	0.00
I want to know how to develop and implement a food defense management plan in detail.	6.10±1.01	6.25±0.91	5.99±1.08	2.74	0.00
I will participate in a seminar or training related to food defense.	5.90±1.18	5.90±1.11	5.89±1.24	0.11	0.91
I am willing to spend some resources (money, time, etc) to implement a food defense management plan.	5.49±1.34	5.64±1.17	5.38±1.46	2.08	0.04
Intention					
I will implement a food defense management plan in my operation.	5.44±1.23	5.59±1.31	5.33±1.16	2.02	0.04

Note. Scale = 1: strongly disagree; 2: Disagree; 3: somewhat disagree; 4: neither; 5: somewhat agree; 6: agree; 7: strongly agree

Current Defensive Practices

Table 4-5 illustrates the frequency operations implement 12 selected food defense practices. The three most frequently performed practices were “our operation purchases all food ingredients, food products, packaging materials, and other foodservice supplies only from reputable suppliers who have appropriate permits or licenses” (6.89 ± 0.34); “our operation requires all job candidates to pass background security checks prior to hiring” (6.63 ± 1.07); and “our operation stores and secures hazardous chemicals outside of food preparation areas and trains employees to use chemicals properly to prevent food contamination and human exposure” (6.32 ± 1.02). The three least frequently performed practices were “our operation trains all employees about the food biosecurity management plan” (3.19 ± 1.93); “our operation maintains a contact list, updated monthly, of local authorities such as the police and fire departments, who should be notified in case of a biosecurity incident and distributes the list to the foodservice staff” (4.39 ± 2.11); and “our operation controls, monitors and secures all access points into the foodservice facility including all food product, food ingredient, and chemical storage areas with alarms, cameras, locks, fences, or other security hardware that meet national and local fire and safety codes” (4.66 ± 1.89).

Among the 12 practices, two and three were more frequently practiced in schools and in healthcares respectively. School foodservice directors indicated that they checked their job candidate’s background ($t = 2.58, p = 0.01$) and controlled and secured their facilities ($t = 2.31, p = 0.02$) more frequently than hospital foodservice operations did. Healthcare foodservices operations were more likely to use clear identification of personnel ($t = 4.12, p = 0.00$), to control former employee’s accessibility to the operation ($t = 2.48, p = 0.01$), and to have more controlled access to their utilities ($t = 3.07, p = 0.00$).

Table 4.5 Frequency of Implementing Twelve Selected Food Defense Practices By Healthcare and School Foodservice Directors

	Total	Healthcares	Schools		
	(n=449)	(n=195)	(n=254)		
Our operation.....	Mean±SD	Mean±SD	Mean±SD	t	p
...purchases all food ingredients, food products, packaging materials, and other foodservice supplies only from reputable suppliers who have appropriate permits or licenses.	6.89±0.34	6.91±0.31	6.88±0.36	0.82	0.41
...requires all job candidates to pass background security checks prior to hiring.	6.63±1.07	6.48±1.34	6.75±0.77	2.58	0.01
...stores and secures hazardous chemicals outside of food preparation areas and trains employees to use chemicals properly to prevent food contamination and human exposure.	6.32±1.02	6.32±1.07	6.32±0.98	0.06	0.95
...assigns an authorized person to verify and receive shipments both during business hours and after business hours.	6.26±1.25	6.32±1.25	6.21±1.24	0.95	0.34
...inspects ingredient packages prior to use for evidence of tampering.	6.14±1.02	6.03±1.10	6.22±0.94	1.93	0.054
...uses a system that ensures clear identification of foodservice personnel and their specific functions within the operation	5.81±1.49	6.12±1.28	5.56±1.59	4.12	0.00
...controls access of all visitors and unauthorized persons to the storage and production areas.	5.69±1.44	5.70±1.42	5.68±1.46	0.19	0.85
...accounts for all keys, uniforms, and identification badges provided to former employees.	5.51±1.71	5.73±1.50	5.34±1.83	2.48	0.01
...restricts access to central controls for airflow, HVAC, water systems, electricity, and gas within foodservice areas.	4.81±1.87	5.12±1.83	4.57±1.87	3.07	0.00
...controls, monitors and secures all access points into the foodservice facility including all food product, food ingredient, and chemical storage areas with alarms, cameras, locks, fences, or other security hardware that meet national and local fire and safety codes	4.66±1.89	4.42±1.96	4.84±1.82	2.31	0.02
...maintains a contact list, updated monthly, of local authorities such as the police and fire departments, who should be notified in case of a biosecurity incident and distributes the list to the foodservice staff.	4.39±2.11	4.35±2.21	4.42±2.03	0.36	0.72
...trains all employees about the food biosecurity management plan.	3.19±1.93	3.16±1.95	3.20±1.91	0.23	0.81

Note. Scale = 1: Never; 2: Seldom; 3: Not very frequently; 4: From time to time; 5: Many times; 6: Most of the time; 7: always

Regional differences

Because this study collected data from different parts of the country, investigation on whether foodservice directors from various parts of the country perceive and behave similarly to each other or not would provide deeper understanding of the respondents. In order to facilitate this regional comparison, respondents from the 50 states were divided into six regions based on the USDA compliance office directory (Appendix G).

A set of one-way ANOVA and post hoc tests were performed using these six regions to elucidate their differences in perceptions, motivations, intentions and current practices. One-way ANOVAs for continuous variables and crosstab analyses for categorical variables were used to assess any regional differences in demographic and operational characteristics.

Based on the ANOVA test result, only one measurement item, “I want to reduce a food terrorism risk as much as possible.” ($F = 3.024$, $p = .011$) was significantly different among the six regions. Post hoc comparison using Tukey method for this item revealed that the foodservice directors in the Western region were less likely to agree with this statement than those in the Southern (mean difference = .456, $p = .015$) and Central (mean difference = .557, $p = .018$) regions. Among the 12 current practices, four practices were performed more frequently in some regions than in others. The four practices were “Our operation accounts for all keys, uniforms, and identification badges provided to former employees” ($F = 3.52$, $p = .004$; Mean difference between Southern and Eastern = .88, p (Tukey) = .001); “Our operation controls access of all visitors and unauthorized persons to the storage and production areas” ($F = 3.38$, $p = .005$; Mean difference between Southern and Eastern = .56, p (Tukey) = .049; Mean difference between Southern and Western = .77, p (Tukey) = .035); “Our operation controls, monitors and secures all access points into the foodservice facility including all food product, food ingredient, and chemical storage areas with alarms, cameras, locks, fences, or other security hardware that meet national and local fire and safety codes” ($F = 2.74$, $p = .019$; Mean difference between Southern and Central = 1.065, p (Tukey) = .031); and “Our operation maintains a contact list, updated monthly, of local authorities such as the police and fire departments, who should be notified in case of a biosecurity incident and distributes the list to the foodservice staff” ($F = 2.25$, $p = .049$; Mean difference between Southern and Northern = 1.27, p (Tukey) = .041). Operations located in the Southern region implemented these four practices more often than those in other regions.

No operational characteristics were significantly different among regions. However, three respondent's characteristics were different among regions: Seminar or training participation experience ($\chi^2 = 13.73$, $p = .017$), RD credential ($\chi^2 = 17.42$, $p = .004$), and level of education ($\chi^2 = 2.861$, $p = .015$). Based on the actual number of respondents compared to the expected number of respondents, study participants from the Eastern region had participated more seminars or trainings more often than respondents in other regions (Table 4-6). Respondents from the Midwest were less likely to participate in a food defense related seminar or training. The actual count for eastern region was only 44 % of the expected count. More respondents in Southern region (132.12 % of the expected count) and in Central region (129.21% of the expected count) possessed RD credential than Eastern (79.46% of the expected count) and Midwest (80.97% of the expected count). Tukey tests showed that the foodservice directors in the Southern region had achieved higher education level than those the Western (mean difference = .58, $p = .021$) and in the Northern region (mean difference = .69, $p = .04$).

Types of seminar/training

Respondents who had participated in a seminar or training about food defense were asked to describe the type of the seminar/training that they had attended. Even though 104 respondents indicated that they had participated in food security training, 23 did not provide the detailed information about the type of training they had attended. The type of seminar/training were categorized based on the type of the organization that provided the seminar/training session. Healthcare foodservice directors ($n = 29$) were more likely to have attended a seminar or training session which was provided by a professional associations or organizations (58.62%) while school foodservice directors ($n = 52$) were more likely to have attended training provided by governmental entities (57.69%). The most professional association/organization identified most often were those from which the sample was selected (HFM and ASHFSA). Federal governmental agencies providing training attended by respondents were USDA, FDA, FBI, Department of Defense, Department of Homeland Security, and US Army and non-federal governmental entities including state, county, city, or local health departments.

Table 4.6 Regional Comparison of Respondents

	Total (N =446) ^a	Eastern (N = 155) ^a	Western (N =69) ^a	Southern (N =90) ^a	Central (N =41) ^a	Midwest (N =58) ^a	Northern (N = 33) ^a		
	Count (Expected)	Count (Expected)	Count (Expected)	Count (Expected)	Count (Expected)	Count (Expected)	Count (Expected)	χ^2	Sig.
Seminar/Training									
Yes	104	49 (36.5)	11 (16.1)	19 (20.8)	11 (9.7)	6 (13.5)	8 (7.3)		
No	335	105 (117.5)	57 (51.9)	69 (67.2)	30 (31.3)	51 (43.5)	23 (23.7)	13.730	0.017
RD									
Yes	192	53 (66.7)	28 (29.9)	51 (38.6)	23 (17.8)	20 (24.7)	17 (14.3)		
No	251	101 (87.3)	41 (39.1)	38 (50.4)	18 (23.2)	37 (32.3)	16 (18.7)	17.472	0.004

^a. Valid responses only are included, thus the variability in number of responses

Discussion and Implication

The PMT was used in this study to investigate the foodservice directors' perception about the threat of a food terrorism attack and their perception towards recommended coping behavior, identified for this study as the implementation of a food defense management plan. The study found that on-site foodservice directors in the U.S. perceived the food terrorism threat as severe and the possibility of food terrorism attack as moderate. Even though the perceived odds of attack were moderate, foodservice directors still express their fear of food terrorism. Therefore, it is strongly recommended to lower the level of the fear that directors need to increase their awareness of the food terrorism and be motivated to develop and implement a food defense management plan.

On-site foodservice directors in this study regarded the implementation of a food defense management plan as an effective strategy to prevent the incidence of food bioterrorism and protect their operations from the possible attack. However, foodservice directors also perceived some barriers in developing and implementing a plan. Time required to develop and implement such a plan was perceived as the most significant barrier. Therefore, informational resources and training sessions should explain the step by step process of implementing a food defense plan with feasible time line. Even though they considered implementing a food defense management plan as somewhat difficult and complicated, the directors believed that they are capable of implementing a plan in their operations. The foodservice directors indicated that consensus among their upper management was more important than other employees when implementing a food defense management plan in their operations.

U.S. on-site foodservice directors were highly motivated to secure their operations, protect their stakeholders and avoid or, at least, reduce a food terrorism risk. They expressed a need for more information about a food defense management plan and interest in participating in educational programs related to food defense. Moreover, they were willing to spend time and to expend resources to implement a food defense management plan. The researcher recommends that governmental entities and academia develop and provide informational materials and training sessions to address the educational needs of foodservice directors.

The foodservice directors indicated that they would implement a food defense management plan in their operations at some point in the future. However, the foodservice

director' behavioral intention was somewhat lower than their approach and avoidance motivation. Future studies should investigate what affects this phenomenon. One of possible explanations would be related to barriers to implementing a management plan. Better insights on how to increase the foodservice directors' intention to implement a food defense management plan would be provided if a future study investigates these barriers in detail. More efforts should be made to decrease negative perceptions towards implementing a food defense management plan to promote it effectively.

Compared to school foodservice directors, foodservice directors in the healthcare sector revealed somewhat stronger avoidance motivation and knowledge seeking motivation while possessing stronger implementation intention. Unfortunately, it was impossible to investigate which characteristic differences between foodservice operations in schools and healthcares influenced this result. One of the possible explanations would be the involvement of the operation with national emergency and preparedness plan. The Bioterrorism Hospital Preparedness Program is designed to enable state and regional planning among local hospitals, emergency medical services systems, health centers, poison control centers, and other health care facilities to improve their preparedness to work together to combat terrorist attacks and manage infectious disease epidemics and other public health emergencies (U.S. HHS, n.d.). Therefore, the healthcare foodservice operations in this study may have more exposure to and are more sensitive to the terrorism and preparedness issues than school foodservice operations. This may have affected their avoidance motivation and further the implementation intention. From this result, it could also be inferred that increasing avoidance motivation among school foodservice directors might be associated with increasing their implementation intention. Future study is recommended to test this causal relationship and to investigate how to increase the avoidance motivation and intention effectively especially among school foodservice directors.

Foodservice directors in both sections appraised their level of threat similarly. School foodservice directors were more likely to believe that it would take several years to recover from a food terrorism attack than the hospital foodservice directors were. While foodservice directors from both sectors perceived the effectiveness of implementing a food defense management plan similarly, school foodservice directors perceived higher implementation costs and indicated that the implementation process would be more difficult than for hospital foodservice directors. These differences may be related to the size and complexity of the operations. Schools in the

sample served more meals and had more employees than the healthcare operations. Therefore, more barriers may appear when developing and implementing a food defense management plan and more time may be required for the recovery. Another deduction could be made based on the systematic differences between school foodservice and hospital foodservice. The survey sample included foodservice directors from school districts. In many cases, the school foodservice within a district operates a central kitchen that delivers foods to satellite kitchens within the district. As a result, these types of operations have more control points compared with foodservice operations that do not transport food to other operations. Physically securing a facility is an essential part of a food defense management plan.

This systematic and size difference might also affect their motivation to avoid the food terrorism risk and to seek additional information about a food defense management plan. Because hospital foodservice directors perceived fewer barriers and less difficulty in implementing a food defense plan than school foodservice directors, they might be more motivated to develop and implement a food defense management plan. Further, these differences in operational characteristics and motivation could account for the hospital foodservice directors' higher implementation intention. Therefore, it is very important to decrease the school foodservice directors' perception of barriers to increase their intention to develop and implement a food defense management plan. Since foodservice directors expressed a desire to attend a seminar or training session, these sessions could provide information on how to decrease perceived barriers.

Some of the preventive measures were already practiced frequently. Practices that are more likely to be included in their policies and procedures or are directly related to food and chemical handling were practiced more frequently than those related to physical securities (access controls), incident reporting (readily accessible contact numbers to local authorities), and food defense employee training. This finding was similar to the previous study. Yoon and Shanklin investigated how frequently Kansas on-site foodservice operations practiced 35 preventive measures in six categories (Yoon & Shanklin 2007a; 2007b). In their study, it was found that chemical handling and food handling were the two most frequently performed preventive practices while utility and facility security and communicating with other authorities and suppliers were less frequently practiced measures. As Yoon and Shanklin surmised in their studies, the use of material safety data sheets might influence the chemical handling practices

and specific policies and procedures for the purpose of preventing accidental contamination. Providing quality food to customers might guide the operations to practice preventive measures related to food handling more frequently. Even though maintaining a contact list of local authorities who should be notified in case of an intentional contamination incident and distributing or making this information readily available to the foodservice staff is a fairly easy and inexpensive preventive measure to implement, it was performed less frequently. Results support those found in Yoon and Shnaklin's. It is recommended that foodservice directors who want to develop and implement a food defense management plan in their operations address these less frequently performed practices first since many are relatively easy and inexpensive to implement. For example, securing all access points into the foodservice facility or maintaining an outside contact list will be easier and require less resource than training all employees for food defense or implementing a system that ensures clear identification of foodservice personnel and their specific functions within the operation. The USDA biosecurity guideline recommended that foodservice operations divide the implementation process into several manageable phases (USDA, 2003).

Interestingly, foodservice operations in the Southern region were practicing these less frequently delivered practices more often than other regions. However, this may have resulted from respondents' characteristics and not from the operational differences. In fact, study participants from the Southern region had more education and were more likely to have the RD credentials than other regions. Additional investigation of foodservice operations in the Southern region could provide more accurate answers to this question and should be explored in future studies.

Regardless of the reason, foodservice operations in this study indicated they implemented recommended food security practices more frequently than previously reported. This may have resulted from the increased level of awareness about food bioterrorism due to increased government activities. In order to maintain this trend, simpler but stronger messages should be a priority in related government agencies and academia. Detailed informational materials have been developed by several government agencies and private companies (e.g. FDA, 2003; USDA, 2003; AIB, 2005) and accessible on websites and in published materials. Even though these resources are readily accessible, the problem is the willingness of the message recipients to study those materials and follow the recommendations. This study showed that the detailed lengthy

introductory material did not differentiate the message recipients' attitudes towards the food defense management plan. Therefore, for the purpose of increasing the awareness level materials should be short but interesting enough to motivate foodservice directors to learn more about the topic.

Implementing a food defense management plan is an addition to the other many responsibilities performed by foodservice directors. Therefore, in order to encourage directors to implement a food defense management plan, providing them with training on how to customize a food defense management plan or how to incorporate food defense practices into existing management systems is needed. For example, a food defense management plan could be incorporated into the operations' disaster management plan, crisis management plan, or Hazard Analysis and Critical Control Points plan.

Limitation and Future Study

Like most research studies, this study had some limitations. These limitations will be addressed and suggestions for future research for improving understanding of why and how foodservice directors would implement a food defense management plan will be discussed in this section.

The first limitation is in the sample pool. Even though the sampling frame included operations in all regions of the U.S., many foodservice directors may not be members of one or more associations used in this study. Therefore, inferences cannot be made to foodservice directors who were not members of these associations. Moreover, the values and opinions shared among association members could possibly affect the results of the study. For school foodservice, this study only included school districts with enrollments of more than 7500 students. Therefore, it is impossible to evaluate the likelihood of foodservice operations implementing a food defense management plan in smaller school districts or in private schools. Further, size difference between hospital foodservice operations and school foodservice operations might affect the comparison between these operations.

Secondly, the survey instrument was very long. Even though the researchers offered incentives to increase response rate; a two-dollar donation to their choice of organization per returned usable response and summary of the study result, a higher response rate would be expected with a shorter questionnaire. Manipulation is another limitation. The study tried to

differentiate the effectiveness perception of food defense management plan by providing more or less information about the concept to investigate whether the effectiveness perception affects their intention. However, this manipulation failed due to no differences between two forms. Even though the manipulation was not the primary purpose of this research, the researcher recommends inclusion of manipulation for future studies to evaluate whether the effectiveness perception would affect the implementation intention and further, actual implementation. The result of such a study would provide valuable insight in the development of messages that would encourage foodservice operations to develop and implement a food defense management plan.

Some of the operational characteristic questions were answered differently than requested. For example, the respondents were asked to provide number of full time equivalent employees (FTEs). However, several respondents provided the number of employees on their payroll rather than the FTEs as requested. In the case of school foodservice operations, because the answer was collected from the district director, some of them provided number of employees in the entire district while others provided number of employees in the largest facility in the district or the average number of foodservice employees per school. This limited analysis of differences based on operational variables and other study constructs of interests for further analyses.

Regional comparison could be another limitation. This study divided the operations into six regions based on the USDA compliance office. Therefore, the regional characteristic could vary within each region too. Each region may not be homogenous, and possibly, the aggregated characteristics of operations in regions may not be accurate for some operations. In order to make the study findings more meaningful, future studies should investigate each region separately. This would assist each compliance office's understanding of the operations in their region.

A future study to elucidate how to effectively decrease the burden that foodservice directors perceive about implementing a food defense management plan is suggested. The relationship between previously developed and currently performed practices and required food defense specific practices should be investigated. In order to do this research, an antecedent study is necessary that closely investigates current practices. The results of these suggested studies may not be generalizable to many other operations. However, results will provide

insights to the foodservice industry about how to efficiently motivate operations to develop and implement a food defense management plan in their operations.

References

- Abraham C. S., Sheeran, P., Abrams, D., & Spears, R. (1994) Exploring teenagers' adaptive and maladaptive thinking in relation to the threat of HIV infection. *Psychology and Health*, 9, 253-272.
- Anderson J. C. and Gerbing D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychology Bulletin*, 103(3), 411-423.
- Annis, H. M., & Davis, C. S. (1988). Assessment of expectancies. In Donovan, D. M., & Marlatt, G. A. (Eds.), *Assessment of addictive behaviors* (p 84-103). New York: Guilford Press.
- Aspinwall L.G., Kemeny, M. E., Taylor S. E., Schnider, S. G., Dudley, J. P., (1991) Psychological predictors of gay men's AIDS risk-reduction behavior. *Health Psychology*, 10, 432-444.
- Axelrod, L., J., & Newton, J. W. (1991). Preventing nuclear war: Beliefs and attitudes as predictors of disarmist and deterrentist behavior. *Journal of Applied Social Psychology*, 21, 29-40.
- Bledsoe, G. E., & Rasco, B. A. (2002). Addressing the risk of bioterrorism in food production. *Food Technology*, 56(2), 43-44, 46-47.
- Block, L. G. & Keller, P. A. (1995). When to accentuate the negative: the effects of perceived efficacy and message framing on intentions to perform a health-related behavior. *Journal of Marketing Research*, 32, 192-203.
- Brown, S. L. (2005). Relationship between risk-taking behavior and subsequent risk perceptions. *British Journal of Psychology*, 96, 155-164.
- Bruemmer, B. (2003). Food biosecurity. *Journal of American Dietetic Association*, 103(6), 687-691.
- Bryant, C. M., McEntire, J., & Newsome, R. (2005). Defending the food supply. *Food Technology*, 59(8), 64-65, 67, 68, 71, 73.
- Campis L. K., Pretice-Dunn, S., & Lyman, R. D. (1989). Coping appraisal & parents' intentions to inform their children about sexual abuse: A protection motivation theory analysis. *Journal of Social & Clinical psychology*, 8, 304-316.
- Center for Defense Information (July 2nd, 2003). A Brief history of terrorism. Retrieved June 12, 2005 from

- http://www.cdi.org/friendlyversion/printversion.cfm?documentID=1502&from_page=../program/document.cfm
- Centers for Disease Control and Prevention.(n.d.) Bioterrorism Agent/Diseases. Retrieved August 4, 2004 from <http://www.bt.cdc.gov/agent/agentlist-category.asp>.
- Federal Emergency Management Agency. (2005). Informing the public about hazards- Backgrounder: Terrorism. Retrieved October 28, 2005 from <http://www.fema.gov/hazards/terrorism/terror.shtm>
- Floyd, D., L., Prentice-Dunn, S., & Rogers, R. W. (2000). A meta-analysis of research on protection motivation theory. *Journal of Applied Social Psychology*, 30, 407-429.
- Gerald, B. L., & Perkin, J. E. (2003). Position of the American Dietetic Association: Food and water supply. *Journal of American Dietetic Association*, 103(9), 1203-1218.
- Hall, M. J., Norwood, A. E., Fullerton, C. S., Gifford, R., & Ursano, R. J. (2004). The psychological burden of bioterrorism. *Journal of Aggression, Maltreatment & Trauma*, 9(1/2), 293-304.
- Hartenian, L. S., Bobko, P., & Berger, P. K., (1993). An empirical validation of bipolar risk perception scaling methods. *Journal of Applied Social Psychology*, 23(5), 335-351.
- Ho, R. (1998). The intention to give up smoking: Disease versus social dimensions. *The Journal of Social Psychology*, 138(3), 368-380.
- Hollingworth, P. (2002). Hot topics address terrorism, fickle consumers, and obesity. *Food Technology*, 56(8), 48-50, 52.
- Kals E., & Montada, L. (2001). Health behavior: An interlocking personal and social task. *Journal of Health Psychology* 6(2) 131-148.
- Kantola, S. J., Syme, G. J., & Nesdale, A. R. (1983). The effects of appraised severity and efficacy in promoting water conservation: An informational analysis. *Journal of Applied Social Psychology*, 13, 164-182.
- Kim, K. (2003). National restaurant association says Food & Drug Administration's proposed one-size-fits-all risk approach may have negative impact on industry, economy. *Nation's Restaurant News*, 39(14), 1-6.
- Kulik, J. A., & Mahler, H. I. M. (1987). Health status, perceptions of risk, and prevention interest for health and nonhealth problems. *Health Psychology*, 6, 15-27.

- Mcmath, B. F. & Prentice-Dunn, S. (2005). Protection motivation theory and skin cancer risk: The role of individual differences in responses to persuasive appeals. *Journal of Applied Social Psychology* 35(3), 621-643.
- Meadows, M. (2004). The FDA and the fight against terrorism. [Electronic version]. *FDA Consumer Magazine*, 38(1) Retrieved May 25th, 2006,
- Melamed, S., Rabinowitz, S., Feiner, M., Weisberg, E., & Ribak, J. (1996). Usefulness of the protection motivation theory in explaining hearing protection device use among male industrial workers. *Health Psychology*, 15(3), 209-215.
- Meyerson, L. A., & Reaser, J. K. (2002). Biosecurity: Moving toward a comprehensive approach. *BioScience*, 52(7), 593-600.
- Milne, S. E., Shhran, P., & Orbell, S. (2000). Prediction and intervention in health-related behaviour: A meta-analysis review of protection motivation theory. *Journal of Applied Social Psychology*, 30, 106-143.
- Peregrin, T. (2002). Bioterrorism and food safety: What nutrition professionals need to know to educated the american public. *Journal of American Dietetic Association*, 102(1), 14-16.
- Reeve, L., Stevenson, P., & Wooton, C. (2006). The AIB international guide to food defense: For food retail and food service operations (K. Beach & R. Wheeler, Eds.). AIB International: Manhattan, KS.
- Rogers, R. W. (1975). A protection motivation theory of fear appeals and attitude change. *The Journal of Psychology*, 91, 93-114.
- Rogers, R. W. (1983). Cognitive and physiological processes in fear appeals and attitude change: A revised theory of protection motivation. In B. L. Cacioppo & L. L Petty (Eds.), *Social psychophysiology: A sourcebook* (pp. 153-176). London, UK: Guilford.
- Ronis, D. L., & Harel, Y. (1989). Health belief and breast self-examination behaviors: Analysis of linear structural relations. *Psychology and Health*, 3, 259-285
- Stauffer, J. E. (2002). Crisis management. *Cereal Foods World*, 47(9), 447-448.
- Tanner, J. F., Hunt, J. B. & Eppright, D. R. (1991). The protection motivation model: a normative model of fear appeals, *Journal of Marketing*, 55, 36-45.
- Umeh, K. (2005). Protection motivation, coping styles and health-related behavioral intentions amongst adolescents. *Psychology and Health*.

- United States Department of Agriculture. (2003). A biosecurity checklist for school foodservice Programs: Developing a biosecurity management plan. Available at: <http://schoolmeals.nal.usda.gov/Safety/biosecurity.pdf>. Accessed September, 2004.
- United States Department of Health and Human Services. (n.d.). Budget documents & information. Retrieved April 17, 2005 from <http://www.hhs.gov/budget/docbudget.htm>
- United States Food and Drug Administration. (2003). Retail Food Stores and Food Service Establishments: Food Security Preventive Measures Guidance (Final Guidance). Retrieved September 3, 2004 from <Http://www.cfsan.fda.gov/~dms/secgui11.html>
- Weinberg, r. S., Hughes, H. H., Critelli, J. W., England, R., & Jackson, A. (1984). Effects of preexisting and manipulated self-efficacy on weight loss in a self-control program. *Journal of Research in Personality*, 18, 352-358.
- Weinstein, N. D. (1987). Unrealistic optimism about illness susceptibility: Conclusions from a community-wide sample. *Journal of Behavioral Medicine*, 10, 481-500.
- White, P. (2002). Food security. *School Foodservice and Nutrition*, 56(8), 42-46.
- Witte, K., Berkowitz, J. M., Cameron, K. A., & McKeon, J. K. (1998). Preventing the spread of genital warts: Using fear appeals to promote self-protective behaviors. *Health Education and Behavior*, 25, 571-585.
- World Health Organization. (2002). Terrorist threats to food: Guidance for establishing and strengthening prevention and response systems. Retrieved August 4, 2004 from http://www.who.int/foodsafety/publications/fs_management/terrorism/en/
- Wurtele, S. K. & Maddus, J. E. (1987). Relative contributions of protection motivation theory components in predicting exercise intentions and behavior. *Health Psychology*, 6, 453-466.
- Yoon, E. & Shanklin, C.W. (2007a). Food security practice in Kansas schools and healthcare facilities. *The Journal of American Dietetic Association*, 107(2), 325-329.
- Yoon, E. & Shanklin, C.W. (2007b). Implementation of food biosecurity management plan against food terrorism in on-site foodservice operations. *Journal of Hospitality and Tourism Research*, 31(2), 224-240.

CHAPTER 5 - Measuring Implementation Intention for Food Defense Management Plan Using Protection Motivation Theory

Abstract

The purpose of this study was to investigate foodservice directors' intentions to implement a food biosecurity management plan in their operations. For this investigation, the protection motivation theory (PMT) was used to measure the perceived risk and directors' implementation intentions more precisely. All measurement items for the construct of interests were measured using 7-point Likert type scales. Questionnaires were mailed to 2,200 randomly selected on-site foodservice directors in March 2007. A total 449 usable completed questionnaires were received. Reliability and validity of a measurement model were assessed before the causal paths were simultaneously tested. Motivation was found to strongly affect foodservice directors' implementation intention. Most of the PMT constructs affected the motivation and the implementation intention except self-efficacy and response cost. Operational efficacy had the strongest effect on motivation of all PMT variables followed by perceived possibility. Theoretical and practical implications, study limitations and recommendation for future study are presented.

Keywords: Protection Motivation Theory (PMT), food terrorism, risk perception, food defense management plan, intention, SEM, school foodservice, healthcare foodservice

Introduction

Since the first reported food terrorism incident in Oregon, 1984 (White, 2002; AIB, 2005; Hasely, 1997) and the anthrax attack in Florida, 2001 (FBI, n.d.), the public concerns about food terrorism in the United States (U.S.) have been increased significantly (Bledsoe & Rasco, 2002; Levin, 2007; Peregrin, 2002; Strong & Stamey, 2004). Uncertainty and lack of information about the risks of bioterrorism within the food chain will enhance fear among those responsible for providing safe food to consumers. Various government agencies and industries are actively involved in developing effective defense mechanisms and increasing stakeholders' awareness of these concerns (Meyerson & Reaser, 2002; Meadows, 2004).

The U.S. government allocated \$ 4.3 billion to protect "America from a possible bioterrorist attack or other catastrophic public health emergency" (United States Department of Health and Human Services [HHS], n.d. p.9). As a result, several research studies in the agriculture and food science disciplines have investigated food security or bioterrorism in the different areas of the food supply chain from farming to manufacturing (e.g., Berry, 2005; Bryant, McEntire, & Newsome, 2005; Blyn, 2006; Meyerson & Reaser, 2002). However, empirical studies investigating end user preparedness and readiness, such as the foodservice industry, have not been conducted thus far (Yoon & Shanklin 2007a, 2007b).

The best way to reduce the risks of food terrorism and its consequences is to develop and implement a food biosecurity/defense management plan (Bledsoe & Rasco, 2002; United States Department of Agriculture [USDA], 2004). Today foodservice professionals and dietetics practitioners are strongly urged to implement customized management plans to protect their customers, clients, and employees from potential acts of bioterrorism (USDA 2003; Bledsoe & Rasco, 2002; Bruemmer, 2003; Peregrin, 2002). In fact, some government agencies, private organizations, and professional and trade associations have published guidelines for developing and implementing a food defense management plan (e.g., Reeve, Stevenson, & Wooten, 2006; National Restaurant Association Educational Foundation [NRAEF], 2003; United States Food and Drug Administration [FDA], 2003; USDA, 2004). However, these agencies have not yet identified effective ways to motivate foodservice directors to implement these guidelines. In fact, foodservice directors may not even be aware of these guidelines.

The protection motivation theory (PMT) was used to investigate what affects foodservice directors' intention to implement a food defense management plan. PMT was first developed and expanded by Rogers (1975; 1983) and is one of the fear appeal models used to predict and influence an individual's behavior. According to PMT, when an individual faces a threat, two cognitive appraisal phases – threat appraisal and coping appraisal – mediate the choice of a coping behavior. In order to persuade individuals to perform preventive behaviors, both appraisal phases should be high enough to form protection motivation (Rogers, 1983).

In the protection motivation theory, perceptions related to risk (i.e. threat appraisal: severity and vulnerability perception) and perceptions related to the effectiveness of preventive measures (i.e. coping appraisal: response efficacy, self-efficacy, response cost) together form a protection motivation. Therefore, investigation into foodservice directors' risk perceptions of food terrorism (severity and vulnerability) and their perceptions about the effectiveness of a defensive management plan (response efficacy, self-efficacy, response cost) was expected to provide more precise information about how likely the foodservice directors were to implement a food defense management plan in their operations.

Literature Review

Theories related to fear appeal and behavior change

Health behavior theories try to explain behavioral change by examining the mechanisms that either shape an intention to change behavior or help to maintain a specific health behavior. Several models have been designed to explain and predict a behavioral intention. Different models have been established to better explain why people fail to maintain the health behaviors to which they had committed themselves. Since 1967, behavioral models using the effect of fear on persuasion have served as the theoretical framework for several research studies.

Janis (1967) adopted and extended the fear-as-acquired-drive model to develop the first systematic theory of fear and persuasion. According to this model, if a persuasive communication arouses fear, people are motivated to reduce this unpleasant drive state. Attitudes are changed when they reduce this state of arousal. Janis proposed that fear arousal has both facilitating and interfering effects. Because of these two contrasting effects, persuasion is an inverted U-shaped function of the level of fear arousal. The optimal level of fear arousal is the point where interfering effects match facilitating effects. In other words, moderate fear appeals

are more effective in persuading people than weak or strong fear appeals because weak appeals create too little drive and strong appeals create too much tension or drive. In the drive theory, weak fear appeal is better than strong fear appeal because strong fear appeal will lead people to avoid the message. Unfortunately, this theory was not validated because of mixed findings (Higbee, 1969) and the lack of empirical evidence (Rogers 1983).

Several researchers have tried to explain why the theory did not work (Beck & Frankel, 1981; Leventhal 1970; Hendrick, Giesen, & Borden, 1975; Rogers, 1983). First of all, variables such as efficacy of recommendations, which should interact with fear arousal, did not interact as predicted by drive theory (Beck & Frankel, 1981; Leventhal 1970; Rogers, 1983). Based on the drive theory, the high fear arousal forms a defensive avoidance reaction, meaning that high threat is less persuasive than low threat. However, some of the early fear appeal studies showed mixed findings on the relationship between level of fear aroused and effectiveness of persuasion (Higbee, 1969). Higbee explored approximately 30 fear appeal studies published between 1953 and 1962 and found that some of studies reported a negative relationship between fear level and persuasion, others had no relationship, and still others produced mixed findings. Leventhal (1970) also found inconsistent results on the relationship posed in the drive model. He summarized the results of fear appeal studies, noting that the number of studies with a positive relationship between the level of fear and persuasion effectiveness is much higher than those with a negative relationship. Leventhal analyzed the correlation between the level of fear arousal and the effectiveness perception of the recommendations and concluded that elevated fear led to a favorable evaluation of the persuasive message. However, according to the drive model, the perceived effectiveness of the recommendation is not considered because the individuals are coping with their reaction to the event rather than to the message on how to respond to the threatening event. Thus, responses to messages are difficult to determine since the individuals are likely to discredit the message.

Second, in studies manipulating false physiological feedback of fear arousal, arousal produced attitude change although the drive theory requires arousal reduction to change the attitude (Hendrick, Giesen, & Borden, 1975; Rogers, 1983). Lastly, several experiments did not find any direct relationship between emotional responses (drive) and attitude change (Beck & Frankel, 1981).

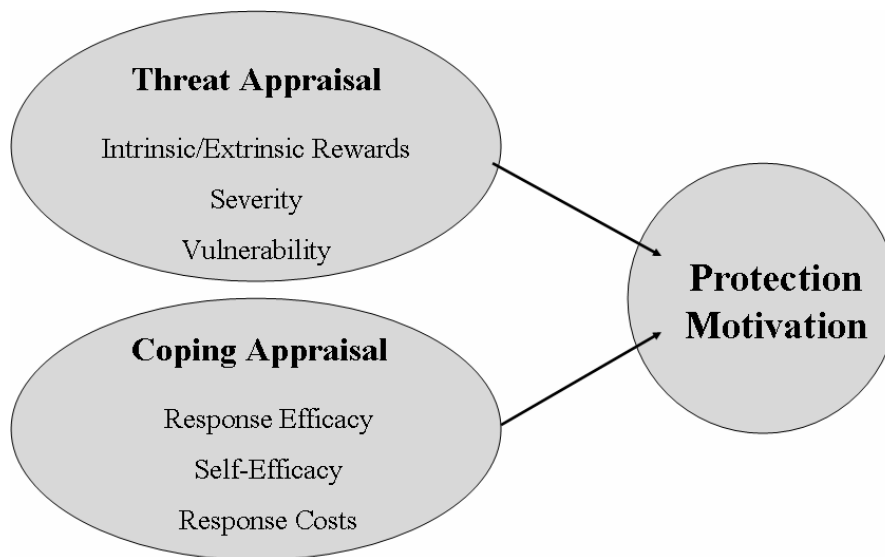
Rejection of the drive model led Leventhal to develop another theory dealing with fear and behavior. Leventhal (1970) proposed a parallel response model that distinguished between emotional reactions to threat and attempts to cope with the threat. According to Leventhal, a fear appeal may initiate a danger control process, which attempts to avoid the threatened danger, or a fear control process, which functions to reduce fear. These two processes are parallel or independent. Attempts to control fear do not necessarily produce adaptive behavior. Instead, adaptive behavior results primarily from the danger control process. Therefore, in the parallel response theory, fear appeals may arouse the emotion of fear, but protective action results from the attempt to control the danger, not from attempts to control the fear. The parallel model differentiates emotional response from cognitive responses to fear-arousing communications (Rogers, 1983).

Protection Motivation Theory

The protection motivation theory (PMT) was first developed by Rogers (1975, 1983) to explain the relationship between feeling fear and health behavior change. According to PMT, when an individual faces a threat, the four major cognitive appraisal processes mediate the choice of a coping behavior. These four processes appraise the information available about the perceived severity of the threat, the perceived probability that the threat will occur, the perceived ability of a coping behavior to remove the threat, and the individual's perceived ability to carry out the coping behavior (self-efficacy). The outcome of these appraisal processes is an intermediate state called "protection motivation" (Rogers, 1983). These four processes can be divided into two different appraisal phases: threat appraisal for the first two and coping appraisal for the other two.

As seen in Figure 5-1, threat is appraised by evaluating the maladaptive response. Besides the severity and vulnerability perceptions, which decrease maladaptive coping, threat appraisal has a rewards component, which facilitates maladaptive coping. These rewards can be divided into intrinsic and extrinsic rewards. For example, a campaign promotes smoking cessation to decrease the possibility of suffering lung cancer in the future. However, some of the message recipients will continue to smoke when intrinsic (e.g., getting rid of stress, pleasure of inhaling, etc.) and extrinsic (e.g., peer approval, tough looking, etc.) rewards are higher than the fear aroused by the message from the campaign.

Figure 5.1 PMT Process (Modified from Rogers, 1983)



The second process, coping appraisal, is associated with proposed health recommendations. It involves the individual's assessment of the effectiveness of the proposed adaptive behavior to avoid the danger, as well as the perceived ability to initiate the recommended actions. High levels of the efficacy variables lead to more likelihood of enacting the adaptive behavior. Perceptions of high response costs in choosing the adaptive behavior decrease this likelihood. In addition to the original two coping appraisal components, any potential costs incurred while performing the recommended behavior also affect its perception. Milne et al. (2000) and Floyd et al. (2000) found that response cost is one of the strongest predictors of protection motivation. Among the coping appraisal components, individual protection motivation is increased by strong self-efficacy and strong response efficacy and decreased by high response cost.

However, the rewards component in the threat appraisal process is seldom included in the empirical PMT studies. Milne and his colleagues (2000) found only one study in which the rewards variable was used. Abraham, Sheeran, Abrams, and Spears (1994) found that rewards (teenagers' 'reputational concern' with using condoms) significantly affected the maladaptive response: message avoidance/denial. Although these authors found that rewards are an important variable in PMT, they also stated that "the conceptual distinction between the reward value of a

risk behavior (e.g. the pleasure of unprotected sexual intercourse) and the cost of preventive measures (e.g. anticipated pleasure loss due to condom use) may not be clear in relation to particular precautions” (Abraham, Sheeran, Abrams, & Spears, 1994, p 257). In fact, no specific reward has been identified for not protecting foodservice operations from a possible food bioterrorism attack. However, the response cost may be an inhibiting factor for implementing a food defense management plan. Therefore, rewards were not used in the threat appraisal process in this study, but response cost in the coping appraisal process was included to take the place of the rewards.

The protection motivation theory provides an important social cognitive account of protective behavior (Rogers, 1975, 1983). Since Rogers first developed the theory, many studies have applied the model to predict and understand protective behaviors, particularly health-related behaviors. Other social cognition models have also been applied to understand and predict health behavior, including the health belief model (HBM), the theory of reasoned action (TRA), and the subjective expected utility (SEU) theory (Weinstein, 1993). These theories share the idea that motivation for protection results from a perceived threat and the desire to avoid the potential negative outcome. The theories also share a cost-benefit analysis component in which the individual weighs the costs of taking precautions against the expected benefits of taking action.

Advantages of using PMT over other theories

The specific key factors incorporated in the risk and non-risk variables of each model differ. For example, the response efficacy of taking the precautionary action is an important variable in the PMT and the health belief model but not in the theory of reasoned action and the subjective expected utility theory. The individual’s assessment of response efficacy (or the perceived effectiveness) cannot be determined directly in the theory of reasoned action and subjective expected utility theory. A primary difference between the health belief model and PMT is the way in which the two are organized (Prentice-Dunn & Rogers, 1986). The health belief model is organized as a catalog of variables contributing to behavior. PMT is organized along two processes that attempt to match the cognitive processes that people use in evaluating threats (the threat-appraisal process) and in selecting among coping alternatives (the coping-appraisal process). PMT is the only one of the four models that has the self-efficacy as a separate component (Weinstein, 1993).

Self-efficacy affects the intention to change risk behavior, the effort expended to attain this goal, and the persistence in continuing in spite of barriers and setbacks that may undermine motivation (Bandura, 1991). Self-efficacy has become a widely applied theoretical construct in models of addiction and relapse (e.g., Annis & Davis, 1988; Baer & Lichtenstein, 1988; Donovan & Marlett, 1988; Marlett & Gordon, 1985). Both response efficacy and self-efficacy play an important role in adopting health behaviors, in changing detrimental habits, and in maintaining change (Bandura, 1991). Schwarzer (1992) noted that, when adopting a desired behavior, individuals first form an intention and then attempt to execute the action. Outcome expectancies (response efficacy) are particularly important in intention formation but less so in action control. Self-efficacy, on the other hand, seems to be crucial in both stages. In fact, there is evidence that self-efficacy is a powerful determinant of behavioral intentions as well as of actual health behavior. Bandura (1977, 1986, 1988, 1991) found that behavior change is mediated through changes in the belief that one can perform a certain action to attain a desired outcome. Self-efficacy predicts intentions and actions in different domains of human functioning. In the health domain, self-efficacy is a powerful resource in coping with stress (Lazarus & Folkman, 1987). Subjects with high self-efficacy tolerate more pain than those with low self-efficacy (Litt, 1988; Manning & Wright, 1983). Self-efficacy affects blood pressure, heart rate, and serum catecholamine levels in challenging or threatening situations (Bandura, Cioffi, Taylor, & Brouillard, 1988; Bandura, Reese, & Adams, 1982; Bandura, Taylor, Williams, Mefford, & Barchas, 1985). In the field of weight control and eating behavior, various studies have used self-efficacy measures (Bernier & Avard, 1986; Chambliss & Murray, 1979; Glynn & Ruderman, 1986; Slater, 1989; Weinberg, Hughes, Critelli, England, & Jackson, 1984). Compliance with medical regimens improved after patients suffering from chronic obstructive pulmonary diseases received self-efficacy training (Kaplan, Atkins, & Reinsch, 1984). Wurtele and Maddux (1987) investigated the role of self-efficacy in initiating and maintaining a regular program of physical exercise. A meta-analysis concluded that the association between self-efficacy and intention was the most robust of all associations between PMT variables and intention (Milne et al., 2000).

PMT has been applied to a number of threats, most being health-related threats, where the model has been used to understand and predict protective health behavior. These health-related threats have included AIDS, alcohol abuse, breast self-examination, cancer, muscular dystrophy,

osteoporosis, and exercise. Floyd et al. (2000) also conducted a meta-analysis, identifying 65 studies that used PMT to explore health-related threats. The studies included cancer prevention (11 studies), exercise/diet/healthy life style (11 studies), smoking (6 studies), AIDs prevention (6 studies), alcohol consumption (5 studies), and adherence to medical-treatment regimens (4 studies).

Beyond health-related issues, PMT has been used to explore injury prevention, political issues, environmental concerns, and protecting others (Floyd et al., 2000). Protective behaviors to which PMT has been applied and that were included in the meta-analysis studies of Floyd et al. (2000) and Milne et al. (2000) included preventing nuclear war (Axlerod & Newton, 1991; Wolf, Gregory, & Stephen, 1986), increasing earthquake preparedness (Mulilis & Lippa, 1990), conserving water (Kantola, Syme, & Nesdale, 1983), driving safely (Griffeth & Rogers, 1976), protecting children (Campis, Prentice-Dunn, & Lyman 1989), improving dental hygiene (Beck & Lund, 1981), ensuring food safety (Schafer, Schafer, Bultena, & Hoiberg, 1993), preventing osteoporosis (Smith-Klohn & Rogers, 1991), using marijuana (Epstein, Bovine, Diaz, & Toth, 1995), seeking emergency help via 911 (Meischke, Eisenberg, Shaeffer, Larsen & Henwood, 1994), and managing pain during recovery after dental surgery (Gidron, McGrath, & Goodday, 1995). According to these meta-analysis results, PMT is a practical model to use in intervention. Variables in the PMT studies included in the meta-analysis had statistically significant effect sizes, indicating that the PMT model can reveal why attitudes and behaviors can change when people feel threatened. Coping appraisal affects the attitude or behavior more strongly than threat appraisal (Floyd et al., 2000; Milne et al., 2000).

Thus, the PMT concept involves any threat for which there is an effective recommended response that can be implemented by the individual. However, no study testing PMT at the business or operational level was found. One unique contribution of this study, therefore, will be the exploration of whether PMT works in a business setting. Slight modification may be necessary to address the characteristics of the study subject, which is a group, not an individual.

Theoretical Framework and Hypotheses

Three expected outcomes of the fear appeal communication

The evaluation of a fear appeal initiates two appraisals of the message. This appraisal results in one of two outcomes: adaptive coping and maladaptive coping. However, in some

other fear appeal studies, such as the fear-as-acquired-drive model and the extended parallel process model, the outcomes were divided into three categories: message ignorance, fear control response, and danger control response (Table 5-1, Witte, 1992; Witte et al., 1998). PMT does not differentiate message ignorance and danger control response. Rather, message ignorance is treated as a part of maladaptive coping (fear control). Witte (1992) proposed the extended parallel process model be used to explain when and why fear appeals work and when and why they do not work. When people receive a message, individuals appraise the threat of hazard first. The more individuals believe themselves to be susceptible to a serious threat, the more motivated they are to begin the second appraisal, which is an evaluation of the efficacy of the recommended response. If the threat is perceived as irrelevant or insignificant, then there is no motivation to process the message further, and people simply ignore the fear appeal (Witte. et al, 1998). When people perceive a serious and relevant threat, they become scared. Their fear motivates them to take any action that will reduce their fear. Beliefs about the effectiveness of the recommended response and beliefs about one's ability to perform the recommended response determine whether people are motivated to control the danger of the threat or to control their fear of the threat. People engage in danger control processes when they believe they are easily, feasibly, and effectively able to avert a serious and relevant threat from occurring by adopting the recommended response. Thus, high perceived efficacy accompanied with high perceived threat initiates danger control responses such as attitude, intention, and behavior change. This danger control response is called protection motivation in PMT.

In contrast, people engage in fear control processes when they do not think they can adopt a recommended response because (a) it is perceived as too difficult, too costly, or too time consuming (low self-efficacy) or (b) they think it will not effectively avert the threat (low response efficacy). When fear control processes occur, people give up on trying to control the danger and, instead, turn to controlling their fear. Thus, low perceived efficacy coupled with high perceived threat promotes fear control responses such as denial, defensive avoidance, or reactance, which result in rejection of the message's recommendations. It is important to note that, if no information is given about the efficacy of the recommended response in the message, individuals will rely on past experiences and prior beliefs to determine perceived efficacy levels (Witte et al., 1998).

Table 5.1 Outcomes of Fear Appeal Communications on Extended Parallel Process Model

Perceived Threat	Perceived Efficacy	Outcome
Low		Message Ignorance
High	Low	Fear Control
High	High	Danger Control (Protection Motivation)

The ultimate goal of this study is to encourage foodservice directors to develop and implement a food defense management plan in their operations. Thus, the desired outcome is the danger control (protection motivation). Therefore, the foodservice directors' perceived threat of a terrorism attack should be high enough to lead them to evaluate the efficacy perceptions. Therefore, hypothesis 1 was proposed.

H1: Foodservice directors perceive a significant amount of threat of possible bioterrorism attacks.

To test the effect of protection motivation on behavioral intention, the following hypothesis was developed.

H2: Foodservice directors with higher protection motivation have higher intention to implement a food defense management plan.

Threat Appraisal

Threat appraisal concerns the process of evaluating the components of a fear appeal that are relevant to an individual's perception of how threatened he or she feels. Threat appraisal is a cognitive evaluation of risk perception (severity and vulnerability). Vulnerability assesses how personally susceptible an individual feels to the communicated threat. Severity perception measures how seriously the individual takes the threat. Milne et al (2000)'s meta-analysis found that correlations between threat appraisal variables and the intention to follow the recommended behavior were significant. However, the correlation coefficient for the severity perception and intention was smaller than all other associations between PMT variables and intention in most of the studies included in the meta-analysis. Several studies indicated that the vulnerability perception was the most significant predictor of behavioral intention. According to Das et al. (2003), vulnerability was the most important variable in persuading individuals to participate in stress management training programs. This relationship was mediated by negative emotions, such as fear and anxiety, and positive thoughts about the recommended solution. A meta-analysis

conducted by Floyd et al. (2000) also found that threat vulnerability and self-efficacy had the strongest effect size with cancer prevention behaviors. However, this relationship varied depending on the behavior being assessed. Different results in the same meta-analysis study indicate that variables related to coping appraisal had stronger effects on AIDS prevention, medical-treatment regimens, healthy diet, and smoking cessation.

Based on the PMT model, the risk perception should affect the message recipients' intentions to follow the recommended behavior to decrease the risk. Most of the studies testing PMT reported a positive relationship between threat appraisal and protection motivation (e.g., Floyd et al., 2000; Milne et al., 2000; Rogers, 1983). In other words, the greater risk the message recipients perceived, the greater their intentions to follow the recommended behavior to reduce or eliminate the risk. Therefore, two research hypotheses were developed to test the relationships between the risk perceptions (severity perception of the bioterrorism attack and vulnerability perception of the operation to the risk) and the motivation to follow the recommendation defined for this study. These hypotheses were as followed:

H3: When the foodservice directors perceive food terrorism as a severe risk, they have a higher motivation to implement a food defense management plan.

H4: When the foodservice directors perceive a food terrorism attack as highly possible, they have higher motivation to implement a food defense management plan.

Coping Appraisal

The coping-appraisal process evaluates the ability to cope with or prevent the threatened danger. The coping-appraisal process comprises efficacy variables and response costs. Response efficacy is the belief that the adaptive response will work. In other words, if the individual believes that taking protective action will be effective in protecting self or others, he or she will implement the action. Self-efficacy is the perceived ability of the person to initiate the adaptive response. Response costs are any costs (monetary, personal, time, effort) associated with implementing the adaptive coping response. Response efficacy and self-efficacy increase the probability of selecting the adaptive response, whereas response costs decrease the probability of selecting adaptive response (e.g., Rogers, 1983; Floyd et al., 2000; Milne et al., 2000).

Since the protective behavior is performed by the foodservice director on behalf of the organization and is not based on his or her response as an individual, the efficacy should be measured accordingly. For example, the foodservice director may perceive that he or she can

implement a food security management plan, but, when organizational factors are considered, the foodservice director's perception may change. Measuring the self-efficacy level of a foodservice director, who is the decision maker, in implementing a food defense plan is necessary but not enough to predict the actual behavior change in an operation. Therefore, the present study examines the perception of foodservice directors related to foodservice operations' ability to implement the food defense management plan.

Based on findings of previous PMT studies (Floyd et al., 2000; Milne et al., 2000.), foodservice directors' efficacy perceptions should positively affect their intentions to implement a food defense management plan in their operations. Response cost, on the other hand, should negatively affect implementation intentions. To test these relationships and to meet two other study objectives ('Examining the on-site foodservice directors' perceived effectiveness of a food defense management plan' and 'Testing protection motivation theory in a business setting'), the following three hypotheses are proposed.

H5: Perceived effectiveness of a food defense management plan positively affects the foodservice director's protection motivation.

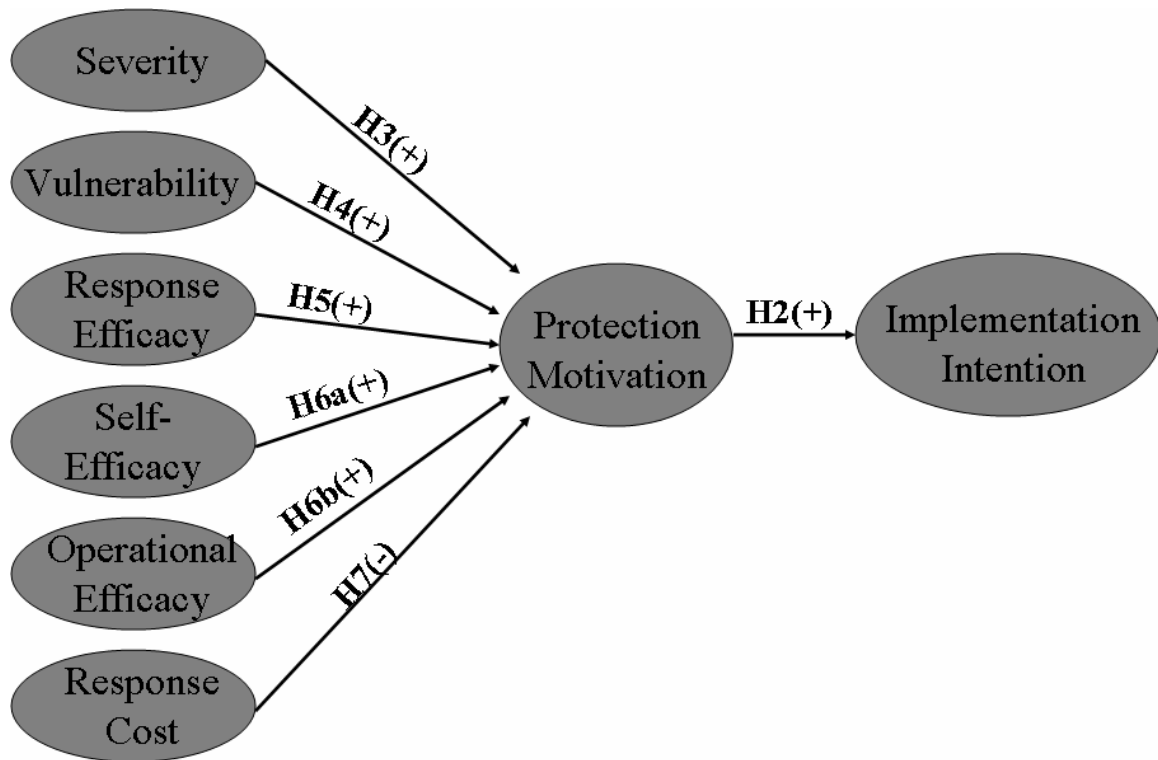
H6a: Perception of the director's ability to implement a food defense management plan positively affects the foodservice director's protection motivation.

H6b: Perception of the operational ability to implement a food defense management plan positively affects the foodservice director's protection motivation.

H7: Perceived barriers to implementing a food defense management plan negatively affect the foodservice director's protection motivation.

All hypotheses, except Hypothesis 1, were tested simultaneously using the structural modeling approach. The conceptual model is presented in Figure 5-2.

Figure 5.2 Operationalized Model for the Study



Methodology

Research Design

A quasi-experimental research design was attempted to differentiate the response efficacy perception. The sample was divided into two groups for the experiment: one group was provided with minimal information about the food defense management plan, and the other group was given detailed information about the plan. The researcher expected that the group with detailed information would possess the higher efficacy level. The detailed information version contained a 504 word description while the simple version had only a 272 word description. The information included in this description was adopted from published guidelines (USDA, 2003; Leeve et al, 2003; FDA 2003). Several true/false questions were inserted after the explanation of the food defense management plan to assess whether the participant had actually read the explanation. These true/false items were directly derived from the content of the explanation.

The brief explanation defined a food defense management plan and then elucidated various types of attackers. A simple one-sentence explanation of how a food defense management plan works was provided. The following one sentence description was included: “A food defense management plan identifies possible attackers and agents and describes practical security measures that should be implemented”. The detailed form explained the steps in developing and implementing a food defense management plan, including who should be included in the management team and how to audit the facility. Resources that may help the foodservice director understand a food defense management plan and develop and implement such a plan was included in a subsequent paragraph.

Instrument Development

An instrument was developed using a series of steps. Empirical studies completed in psychology and communication using protection motivation theory and approach-avoidance motivation concepts were reviewed for initial measurement item development. Rogers (1983) stated that protection motivation is an intermediate state. Therefore, most of the previous PMT studies did not actually measure motivation. These previous studies assume that the protection motivation is formed through the antecedent appraisal phases and then they measure behavioral intention or actual behavior by assessing the level of motivation aroused. In order to measure the motivation more accurately, approach-avoidance motivation was utilized. Motivation can be derived from various types of needs: drives (physiological needs), social needs, mastery needs, self-enhancement needs, etc. Motivation also can be categorized as approach-avoidance, conscious-unconscious, or intrinsic-extrinsic. Push and pull motivations are frequently used in the field of tourism research. Among these various concepts, approach-avoidance motivation is more relevant to this study than others. Approach motivation is directed towards desirable outcomes (e.g. protected operation) while avoidance motivation is directed away from undesirable outcomes (e.g. food terrorism risk) (Lieberman, 2003). This study measured protection motivation by evaluating both consequence of an attack (avoidance) and the effect of protection (approach). Using these types of motivation measurement items should enable the researcher to measure the motivation more accurately than other approaches.

All measurement items for the construct of interests were measured using 7-point Likert type scales. Multiple items within each construct were developed and included based on the

previous PMT studies. Prior to the pilot test, the instrument was modified based on feedback from a group of experts. Fifteen experts in various fields participated in this step of instrument refinement. The expert group consisted of emergency communication specialists, communication researchers, foodservice educators and researchers, actual foodservice directors and food scientists. The modified survey instrument was then mailed to 200 on-site foodservice directors. Because of the low response rate (11%), discriminant validity of measurement items could not be assessed by any means. However, the correlations between variables provided evidence of convergent validity. Cronbach's alphas ranged from 0.8148 (vulnerability) to 0.9795 (fear). These values were above the suggested alpha level of .70 for internal consistency (Nunnally, 1978). Due to the limited numbers of responses, caution should be taken in interpreting the results; however, the measurement items appeared to be reliable.

Sample and Data Collection

Members of two professional associations of foodservice directors in hospitals and foodservice directors in school districts with enrollment of 7,500 or larger were the sampling pool of the study. From each of these unique groups of sampling frames, 1100 people were randomly selected as a study sample. Therefore, 550 hospital foodservice directors and 550 school foodservice directors received detailed information about the food defense management plan, while the other 1100 foodservice directors from both hospitals and school districts received a simpler version of the instrument.

The survey packet was mailed on the second week of March 2007. The packet contained the 12 page questionnaire, a cover letter from the researchers with the Institutional Review Board (IRB) information, a supporting letter from a professional association, a complimentary summary request card, and a postage-paid return envelope. Supporting letters were acquired from the president of each association to encourage members' participation. Another effort was made to encourage the response rate by promising a two dollar donation to the choice of organizations. These organizations included three professional associations linked with sample for the organizations' scholarship fund, the March of Dimes, and the National Breast Cancer Foundation. A total 449 usable completed questionnaires were received at the beginning of May 2007; 25 were returned as undeliverable.

Based on delivered questionnaires, overall response rate was 20.64%. The age of the respondents ranged from 27 to 71 with a mean age of 50.46. A majority of the respondents had bachelor's degrees or higher (87.9%). The survey respondents were predominantly female (71.5%). More than 20% of respondents (23.2%) had attended a seminar or training related to food defense. Years of experience in foodservice ranged from 0 to 55 years with a mean of 24.06 years. Years in the current position ranged from 0.1 to 38 with a mean of 10.06 years.

The majority (77.7%) of the operations had one or more designated employees who were responsible for food safety. Only 31.0% of the operations had one or more employees whose responsibility was to implement or monitor food defense practices. The majority of the operations had some type of crisis management plan (81.5%). Many operations (76.8%) did not audit their facilities to check how well secured their operations were against possible food adulteration. Among the audited operations, the auditing process was performed the most by the operation itself (68.1%) followed by governmental agencies (22.3%) or third party agencies (9.6%).

Data Analysis and Result

Following the recommendations of Anderson and Gerbing (1988), the two-step approach was used in this study. The measurement model was checked using a confirmatory factor analysis. Reliability and validity were checked before structural equation modeling. SPSS 13.0 and Amos 4.0 were used for all statistical data analyses.

Before testing the model, a set of one-sample one-tailed t-test was performed to test hypothesis 1, "Foodservice directors perceive a significant amount of threat of possible bioterrorism attacks." The test value was 4 which was designed as 'neither agree nor disagree' in the questionnaire. Since this hypothesis was designed to test threat appraisal, both severity and vulnerability perceptions were tested. As shown in Table 5-2, overall, the respondents perceived a significant amount of threat. Among eight individual threat appraising measurement items, seven items were statistically significantly. The variable asking the perceived probability that someone would attack the respondents' operations was not statistically significant. However, another item that asked whether the respondents were concerned about the intentional contamination of food in their operations was significant. Combined, it was inferred that foodservice directors who participated in this study thought that food terrorism would occur in

the food industry and they were worried about the impact of food terrorism attack; however, they did not think their operations would be a target. Therefore, overall it is concluded that hypothesis 1 is generally supported.

Table 5.2 One Sample t-tests for Hypothesis 1 Testing

Item ^a	<i>M ± SD</i>	<i>T statistic</i>
Severity Perception ^b	6.37 ± .74	67.57***
If someone intentionally contaminates food in my operation, my employees or customers will suffer from the attack.	6.63 ± .71	77.91***
If someone intentionally contaminates food in my operation, it will damage the reputation of my facility.	6.61 ± .80	68.72***
If someone intentionally contaminates food in my operation, it will take years for my operation to recover from the attack.	5.87 ± 1.21	32.75***
Vulnerability Perception ^b	4.61 ± .96	13.49***
I am concerned about the intentional contamination of food in my operation.	5.05 ± 1.37	16.31***
The food supply chain in the U. S. is at risk of a terrorist attack.	5.61 ± 1.12	30.38***
Industries related to the food supply chain in the U. S. are at higher risk of terrorist attack than other industries.	4.54 ± 1.34	8.52***
It is likely that someone will attack a foodservice operation.	4.55 ± 1.25	9.37***
It is likely that someone will attack my operation.	3.31 ± 1.22	12.08 ^{ns}

Note: ^{ns} not significant; * significant at .05; ** significant at .01; *** significant at .001

^a. Ha = Means for each threat appraising statement are significantly higher than 4.

Ho = Means for each threat appraising statement are equal to or smaller than 4.

^b. Constructs – aggregated from the observed measurement items (average)

Scale = 1: strongly disagree; 2: Disagree; 3: somewhat disagree; 4: neither; 5: somewhat agree; 6: agree; 7: strongly agree

The test results showed that severity perception was rated higher than vulnerability perception. In other words, on-site foodservice directors perceived a food terrorism attack as a serious threat but did not have a high severity perception that the attack would occur in their operations. Since foodservice directors perceived some level of threat of possible bioterrorism attacks, further analyses was performed.

Measurement Model

The error variances between two observed variables for motivation were highly correlated. The modification indices for this relationship were greater than 200. Once this modification was reflected in the model, the measurement model was significantly improved ($\chi^2 = 895.77$, $df = 378$; NFI = .87; TLI = .91; CFI = .92; IFI = .92; RMSEA = .055).

Composite reliability of each construct was calculated to examine the reliability of indicators. The cut off value of .70 was determined based on the recommendation by Hair, et al. (1995). All constructs, except the operational efficacy construct, had composite reliability of indicators higher than .70. The composite reliability of the operational efficacy construct was lower than .70 which means the measurement item might not be reliable. Therefore, caution should be taken when the result of the study is interpreted. Table 5-3 presents mean, standard deviation, and standardized loadings of each indicator along with composite reliability of measurement items and the average variance extracted (AVE) for each construct. AVE was calculated to assess convergent validity and discriminant validity.

Fornell and Larcker (1981) suggested the value of .50 for AVE to meet the convergent validity criteria. Convergent validity was satisfied for most of the construct except the operational efficacy constructs. All measurement items loaded on their expected constructs as shown in Table 5-3. Factor loadings of the observed variables for each latent variable including operational efficacy were significant at .05 (Anderson and Gerbing, 1988). Therefore, this study concluded that the convergent validity of this measurement model was moderately satisfied.

Discriminant validity of the measurement was assessed by comparing the AVE with the squared correlation between latent constructs (Fornell & Larcker, 1981). AVE for each construct should exceed the squared correlation between constructs. As shown in Table 5-4, AVE of each constructs ranged from .30 to .90 and the square of correlation ranged from <.01 to .62. The squared correlation between operational efficacy and motivation was .42, and operational efficacy and implementation intention was .62 which were higher than AVE for operational efficacy. This problem may be caused by the measurement items for the operational efficacy construct. These measurement items were very closely related to motivation and intention. As previously noted in the discussion of the composite reliability, the result should be interpreted carefully since some violation on discriminant validity was detected.

Table 5.3 Means, Standard Deviations, and Factor Loadings, Composite Reliability, and AVE for Confirmatory Factor Analysis (N=449)

	Standardized Loadings ^a								<i>M ± SD^b</i>
	<i>F</i> ₁	<i>F</i> ₂	<i>F</i> ₃	<i>F</i> ₄	<i>F</i> ₅	<i>F</i> ₆	<i>F</i> ₇	<i>F</i> ₈	
SEV2	.67								6.63 ± .71
SEV3	.85								6.61 ± .80
SEV4	.62								5.87 ± 1.21
VUL1		.68							5.05 ± 1.37
VUL2		.70							5.61 ± 1.12
VUL3		.58							4.54 ± 1.34
VUL4		.80							4.55 ± 1.25
VUL5		.71							3.31 ± 1.22
REE1			.45						4.98 ± 1.45
REE2			.91						5.97 ± 1.00
REE3			.90						5.95 ± 1.09
REE4			.81						6.02 ± .93
REC1				.61					3.58 ± 1.59
REC2				.77					3.36 ± 1.50
REC3				.88					3.87 ± 1.49
REC4				.68					4.89 ± 1.44
EFS2					.91				3.55 ± 1.31
EFS3					.91				3.47 ± 1.31
EFO1						.49			5.19 ± 1.15
EFO5						.46			5.96 ± 1.04
MOT1							.76		6.28 ± .86
MOT2							.60		6.74 ± .50
MOT3							.50		6.75 ± .55
MOT4							.73		6.33 ± .93
MOT5							.83		6.47 ± .83
MOT6							.60		6.55 ± .84
MOT7							.62		6.55 ± .67
INT3								.88	5.08 ± 1.11
INT4								.85	5.44 ± 1.12
INT5								.71	5.23 ± 1.49
Composite Reliability	0.84	0.88	0.91	0.89	0.95	0.46	0.90	0.91	
AVE	0.65	0.61	0.73	0.68	0.90	0.30	0.57	0.78	

^aAll factor loadings were significant at .05

^bScales: 7 point Likert type scale (1: strongly disagree ~ 7: strongly agree)

^c Factor labels: *F*₁ –Severity; *F*₂ –Vulnerability; *F*₃ –Response Efficacy; *F*₄ –Response Cost; *F*₅ – Self-efficacy; *F*₆ –Operational Efficacy; *F*₇ –Motivation; *F*₈ – Intention

Note: χ^2 =895.77, df = 378; NFI= .87; TLI=.91; CFI=.92; IFI = .92; RMSEA=.055

Table 5.4 Correlation Matrix, Means and Standard Deviation of Measurement Model

	SEV	VUL	REE	REC	EFS	EFO	MOT	INT	<i>M ± SD</i>
SEV	1.00								6.37 ± .74
VUL	.33*** (.11)	1.00							4.61 ± .96
REE	.23*** (.05)	.38*** (.14)	1.00						5.73 ± .92
REC	.07 (.01)	-.03 (<.01)	-.16** (.02)	1.00					3.93 ± 1.22
EFS	-.12* (.02)	.03 (<.01)	-.03 (<.01)	-.58*** (.33)	1.00				3.51 ± 1.25
EFO	.24** (.06)	.36*** (.13)	.70*** (.48)	-.41*** (.17)	.12 (.01)	1.00			5.57 ± .85
MOT	.29*** (.08)	.34*** (.11)	.36*** (.13)	-.13* (.02)	.02 (<.01)	.65*** (.42)	1.00		6.54 ± .54
INT	.10 (.01)	.43*** (.18)	.44*** (.19)	-.25*** (.06)	.13* (.02)	.79*** (.62)	.47*** (.22)	1.00	5.22 ± 1.22
AVE	0.65	0.61	0.73	0.68	0.90	0.30	0.57	0.78	

Note: SEV–Severity; VUL–Vulnerability; REE–Response Efficacy; REC–Response Cost; EFS– Self-efficacy; EFO–Operational Efficacy; MOT– Motivation; INT– Intention

* significant at $\alpha = .05$, ** significant at $\alpha = .01$ *** significant at $\alpha = .001$

Structural Model and Hypotheses Testing

The hypothesized relationships among PMT constructs were tested simultaneously in a structural equation model. Goodness-of-fit indices ($\chi^2 = 1219.81$; $df = 395$; $\chi^2/df = 3.09$; $P = .000$; $RMSEA = 0.068$; $CFI = 0.87$; $NFI = 0.82$; $TLI = 0.86$; $PRATIO = 0.91$) showed that the proposed structural equation model fits the data. There were some mixed findings on goodness-of-fit indices captured by the AMOS. Some of these indices were higher than the suggested cut off values but the others were slightly less than the suggested acceptance level.

Standardized path coefficients were used to test the hypotheses. As illustrated in Table 5-5 and Figure 5-3, t-values were significant at the alpha level of .05, thus H2, H3, H4, H5, and H6b were supported. Motivation was found to strongly affect foodservice directors' implementation intention ($\beta = .49$, $t = 8.17$, $p = <.01$). Most of the PMT constructs affected the motivation and the implementation intention except the self-efficacy and the response cost constructs. Perceived operational efficacy had the strongest effect on motivation of all PMT

variables ($\gamma = .54$, $t = 4.33$, $p = <.01$) followed by perceived vulnerability ($\gamma = .24$, $t = 4.35$, $p = <.01$).

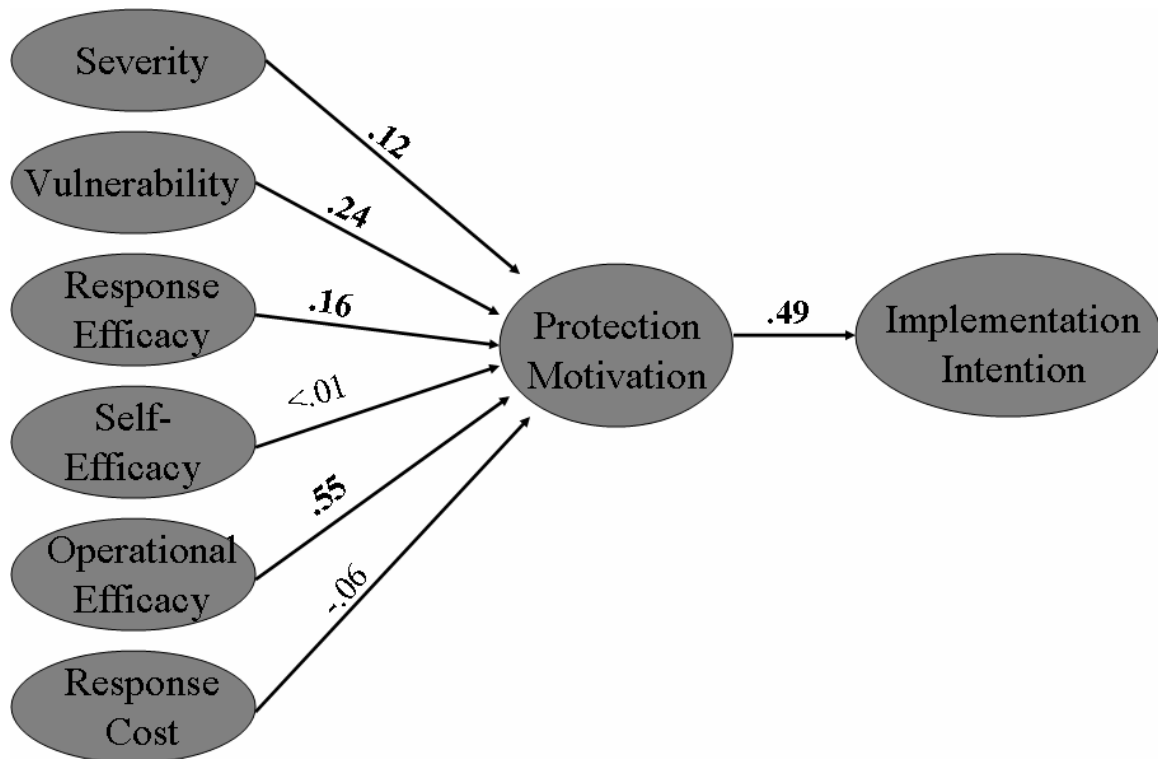
Table 5.5 Testing Hypotheses: Parameter Estimates, Significance and Fit Indices

	Standardized Solution	<i>t</i>	<i>p</i>
H2: Protection Motivation → Implementation Intention	0.49	8.17	<0.01
H3:Severity → Protection Motivation	0.12	2.14	0.03
H4:Vulnerability → Protection Motivation	0.24	4.35	<0.01
H5:Response Efficacy → Protection Motivation	0.16	2.74	<0.01
H6a: Self Efficacy → Protection Motivation	0.003	0.05	0.96
H6b: Operational Efficacy → Protection Motivation	0.54	4.33	<0.01
H7: Response Cost → Protection Motivation	-0.06	1.04	0.30
Goodness-of-fit statistics			
$\chi^2 = 1219.81$; $df = 395$; $\chi^2/df = 3.09$			
RMSEA = 0.068;			
NFI = 0.82;			
CFI = 0.87;			
TLI = 0.86;			
PRATIO = 0.91			

Perceptions on response cost (H7) showed the negative sign as hypothesized but the probability was not significant at the alpha level of .05 ($\gamma = -.06$, $t = 1.04$, $p = .30$). There can be two possible explanations for this result: measurement error and response error. First of all, it is possible that the measurement items were not understood correctly by the survey participants or did not measure the construct as intended. Even though the instrument was developed through several different steps, it is possible that the wordings of the items were confusing or not clear. The other explanation this result occurred was due to response error. Measurement items for response cost were listed right after the response efficacy measurement items in the questionnaire. Some respondents may have rated these items higher due to the location of the measurement items in the questionnaire. The standard deviations for measurement items for response cost were consistently greater than those for measurement items for other constructs in the study. This could be a clue for why response cost did not affect the protection motivation in

this study. Future research should explore whether relocating these items did in fact influence responses.

Figure 5.3 Path Coefficients



While the foodservice director's perception of operational efficacy strongly affected the motivation (H6b), their self-efficacy did not affect the foodservice director's protection motivation (H6a). This finding is also compatible with the correlations between these constructs presented in the Table 5-4. Among all of the precedent threat and coping appraisal constructs, only self-efficacy had insignificant correlations with motivation while the operational efficacy construct has the high construct correlation coefficients with intention and motivation. Therefore, it was concluded that self-efficacy perception did not influence the protection motivation but the operational efficacy perception affect the protection motivation in this study. However, self-efficacy construct still had a significant correlation coefficient with intention directly. Therefore, this construct should not be neglected even though the research hypothesis was rejected.

Discussions

Overall, adoption of the protection motivation theory successfully guided the researcher to investigate foodservice directors' risk perception of food terrorism, perception of a food defense management plan, and how these perceptions affect their motivation to protect their operations which directly influenced their intention to implement a food defense management plan. On-site foodservice directors were willing to implement a food defense management plan in the following situation: when they thought a food terrorism attack would damage the operation severely, when they perceived the possibility that food terrorism would occur in their own operations, when they regarded that implementing a defensive management plan was effective to prevent the threat, and when they believe their operations would be able to implement a food defense management plan.

Foodservice directors were highly motivated to avoid a terrorism risk and protect their operations. In contrast, their intentions to implement a food defense management plan were somewhat lower than their motivation level. They agreed that implementation of a defensive management plan is effective in preventing a terrorist attack. Foodservice directors thought implementing such a plan would require some but not a lot of monetary or non-monetary resources. The confidence level that the foodservice directors themselves and their operations could implement a food defense management plan was moderate.

On-site foodservice directors perceived that the result of a food terrorism attack would be very severe. They somewhat agreed that the food supply chain in the U.S. was at high risk of a terrorist attack and that someone would attack a foodservice operation but they were more likely to disagree that their operation could be a target for such attack. This finding can be explained by the cognitive bias theories related to risk perception. People are likely to underestimate the probability that something really bad can happen to them and not others and to overestimate the probability that something good can happen to them. Unrealistic optimism might cause this result. Unrealistic optimism refers to the phenomenon that people systematically overestimate the probability that good things will happen to them and underestimate the probability that bad things will happen to them (Weinstein, 1987).

Foodservice directors less strongly agreed on vulnerability perception than on severity perception. However, it appears that protection motivation is more affected by vulnerability perception than by severity perception. This was similar to the result of other previous PMT

studies. Brewer, Chapman, Gibbons, Gerrard, MaCaul, and Weinstein (2007) reported that the magnitude of the associations between behavior and perceived risk likelihood or susceptibility was somewhat larger than between behavior and severity perception that had been reported for many previous studies on risk perception and health behavior. Milne et al. (2000) in their meta-analysis study also revealed that the association between severity and intention was small while the association between the vulnerability and intention was a bit larger. However, previous studies found that coping appraisal had a somewhat stronger impact on the behavior or the behavioral intention (Floyd et al, 2000; Milne et al., 2000).

The meta-analysis study performed by Floyd et al. in 2000 revealed that the variables related to coping had slightly stronger relations with the adaptive behaviors than did the variables measuring the threat. Similar results were reported by Milne et al. (2000). Among these coping appraisal variables, the self-efficacy had the strongest association with intention, concurrent behavior, and subsequent behavior (Milne et al., 2000). This present study failed to find a significant association between self-efficacy and the protection motivation. Instead, it was found that operational efficacy affect the protection motivation more than any other appraisal constructs do. In other words, in the group or business setting, it is important to include not only the decision maker's self-efficacy perception but also his/her perception on whether the operation is able to implement such management plan. Because of the low composite reliability and AVE values, however, this finding should be interpreted with a caution. It is strongly recommended that future studies revise the measurement items for this construct,

PMT had been tested in various situations targeting individual behavioral changes related to the individual's well being (e.g. Bandura, Cioffi, Taylor, & Brouillard, 1988; Bernier & Avard, 1986; Chambliss & Murray, 1979; Glynn & Ruderman, 1986; Kaplan, Atkins, & Reinsch, 1984; Slater, 1989; Weinberg, Hughes, Critelli, England, & Jackson, 1984). However, PMT had never been tested in a group setting. In the group setting, the decision maker and the object of protection do not coincide. Unlike the individual setting, the protection motivation evoked by the decision maker will not only affect himself or herself but also others involved in the group. More importantly, in many cases the decision may not be made by an individual but by groups of people (i.e. upper management team or a board of stockholders, etc.). In the foodservice industry, the objects of protection from bioterrorism attack range from the direct stakeholders, such as the clients/customers and employees of the operation, to the general public.

As a result, self-efficacy perception (whether a foodservice director perceives that he/she can implement a food defense management plan in this study) might not significantly affect the protection motivation (the foodservice directors' motivation to avoid the terrorism risk and to protect their operations) as much as it does in other individual health threatening behaviors. In addition, even though self-efficacy in this study did not affect the motivation, it may still influence the behavioral intention like it did in other PMT studies. In fact, the significant positive correlation coefficients between the self-efficacy and intention were discovered. The magnitude was somewhat smaller than the correlation coefficients between intention and all the other constructs except severity perception. However, because the conceptual model that this study proposed did not allow antecedents to directly affect intention, the direct relationship between these five threat and coping appraisal variables and the implementation intention was not tested.

Study Implications

Theoretical Implications

The findings of the study suggest some theoretical implications. First, PMT can be used in a group setting with a caution especially for measuring the self-efficacy construct. Since the decision maker and the actual behavior cannot be identical and there can be various people involved in the decision making process, measuring the perceived ability to follow the recommended behavior is more sophisticated. From the stage of scale development to the stage of final model decision, future PMT studies in a group or a business setting should pay extra attention to this efficacy construct.

Secondly, the protection motivation can be successfully measured rather than being a name of the intermediate status assumed to be formed by threat appraisal and coping appraisal. This study actually measured protection motivation while previous PMT studies just assumed that the protection motivation was an intermediate state that was formed by threat appraisal and coping appraisal processes. As a result, previous studies did not explore the relationships between these antecedent appraising variables and their protection motivation but between those and behavioral intention, current behavior, or/and subsequent behavior. In order to increase the predictive power of a model, it is strongly recommended that future studies measure protection motivation directly.

Practical Implications

This study identified foodservice director intentions to implement a food defense management plan. The results of this study provided useful information that governmental agencies and professional associations can use to identify communication mechanisms and training strategies that will help foodservice operations adopt food defense management plans. Understanding the decision making mechanism is important because government agencies, policy makers, foodservice professionals, and researchers can develop information for campaigns, flyers, seminars, or trainings to promote implementation intentions. The result of this study will help in developing effective persuasion messages that will motivate foodservice directors to implement a food defense management plan in their operations. In fact some governmental agencies, such as USDA and FDA, have published guidelines for developing and implementing a food defense management plan. However, these agencies have not identified ways to motivate foodservice directors to implement the guidelines.

This study provides the agencies insights into how to motivate foodservice directors to access, read, and implement the guidelines. When designing communication resources, the result of this study suggests more or less important aspects that should be considered when developing messages to enhance foodservice directors' motivation to implement food defense management plan. The causal paths that showed greater impacts on the motivation should be emphasized rather than those showing less impact. Therefore, educational and informational resources related to intentional food contamination and its defense should emphasize operational efficacy, possibility perception, response efficacy, and severity perception since these were influential factors on protection motivation. Since the self-efficacy is not as influential as was found in previous PMT studies, messages developed to increase self-efficacy may be less effective than those developed to increase operational efficacy and risk susceptibility perception. Thus, messages should focus on how implementing a food defense plan can be effective. The messages should be designed to increase foodservice directors' awareness of risk perception toward a food terrorism event. However, further quasi-experimental or experimental studies should be conducted to validate this argument by differentiating these different perceptions successfully.

Limitations and Suggestions for Future Study

The findings of the study need to be interpreted with caution. As the first empirical study measuring protection motivation in a group setting, some of the measurement items did not measure the designated constructs. Even though it was revealed that the operational efficacy was one of the strongest influential constructs on the protection motivation, this construct had a low composite reliability and a discriminant validity issue. Therefore, the result of the study should be interpreted with extra caution. In addition, the response cost did not affect the protection motivation, which was supposed to affect the motivation significantly. Possible measurement error and response error issues were discussed in the result part of this manuscript. In order to confirm the findings of this study, future studies are strongly recommended to revise these measurement items.

Even though the data were collected from on-site foodservice operations that are located in all geographic regions in the U. S., the sampling was performed within certain criteria. Healthcare foodservice directors who are not members of professional associations involved in this study and school foodservice directors in a school with an enrollment of less than 7,500 were not included in this study. In addition, the values and opinions shared among association members may possibly affect the results of the study. Therefore, the findings may not be applicable to the foodservice operations whose directors are not members of one of the professional associations involved in this study or in schools with less than 7,500 students. The results cannot be generalized to other foodservice segments such as commercial restaurants. Future research should investigate perceptions, motivation, and intentions of directors employed in other types of foodservice operations. This study should increase the food terrorism risk awareness among these operations and further assess how to motivate them to implement a food defense management plan.

As a cross-sectional study, this study measured the foodservice directors' food defense management plan implementation intention. Behavioral intention would affect the actual future behavior or not. Even though the purpose of this study was to investigate the foodservice directors' motivation and intention to implement a food defense management plan, it would add more precision if this study was able to follow up with the directors who participated. Future

studies should investigate changes of foodservice operations' risk and security perceptions during different implementation stages.

This was the first PMT study that was adopted in a group/business setting. Therefore, similar studies should be conducted before this finding is generalized. Even though the self-efficacy did not affect the protection motivation in this study, future studies should investigate this construct more carefully.

Another possible limitation is related to respondents. Study participants might provide socially acceptable responses. For example, the foodservice directors might respond that they perceive the barriers in implementing a food defense management plan in their operation as moderate even though they actually thought implementing such a plan would cost significantly. Most survey based research experiences the same problem. Respondents are likely to provide socially desirable answers even to very ordinary questions. However, studies that are conducted using a face-to-face interview are more likely to produce this reaction than self-administered survey studies (Dillman, 2000). Moreover, this study did not ask questions related to personal lives but measured more objective perceptions related to their facilities. In addition, respondents were assured of the confidentiality of their answers. Therefore, social desirability of answers was assumed to be a minor concern in interpreting the results.

References

- Abraham C. S., Sheeran, P., Abrams, D., & Spears, R. (1994) Exploring teenagers' adaptive and maladaptive thinking in relation to the threat of HIV infection. *Psychology and Health*, 9, 253-272.
- Anderson J. C. and Gerbing D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychology Bulletin*, 103(3), 411-423.
- Annis, H. M., & Davis, C. S. (1988). Assessment of expectancies. In Donovan, D. M., & Marlatt, G. A. (Eds.), *Assessment of addictive behaviors* (p 84-103). New York: Guilford Press.
- Axelrod, L. J., & Newton, J. W. (1991). Preventing nuclear war: Beliefs and attitudes as predictors of disarmist and deterrentist behavior. *Journal of Applied Social Psychology*, 21, 29-40.
- Baer J. S., & Lichtenstein, E. (1988). Cognitive assessment. In Donovan, D. M., & Marlatt, G. A. (Eds.), *Assessment of addictive behaviors* (p 104-110). New York: Guilford Press.
- Bandura A. (1986). *Social foundations of thought and action*. Englewood Cliffs, NJ:Prentice Hall.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84, 191-215.
- Bandura, A. (1988). Self-efficacy conception of anxiety. *Anxiety Research*, 1, 77-98
- Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes*, 50, 248-287.
- Bandura, A., Cioffi, D., Taylor, C. B., & Brouillard, M. E. (1988). Perceived self-efficacy in coping with cognitive stressors and opioid activation. *Journal of Personality and Social Psychology*, 55, 479-488.
- Bandura, A., Reese, L., & Adams, N. E., (1982). Micro-analysis of action and fear arousal as a function of differential levels of perceived self-efficacy. *Journal of Personality and Social Psychology*, 43, 5-21.
- Bandura, A., Taylor, C. B., Williams, S. L., Mefford, I. N., & Barchas, J. D. (1985). Catecholamine secretion as a function of perceived coping self-efficacy. *Journal of Consulting and Clinical Psychology*, 53, 406-414.

- Beck, K. H. & Lund, a. K. (1981). The effects of health threat seriousness and personal efficacy upon intentions and behavior. *Journal of Applied Social Psychology*, 11, 401-415.
- Beck, K. H., & Frankel, A.(1981). A conceptualization of threat communications and preventive health behavior. *Social Psychology Quarterly*, 44, 204-217.
- Bernier, M. & Avard, J., (1986). Self-efficacy, outcome and attrition in a weight reduction program. *Cognitive Therapy and Research*, 10, 319-338.
- Berry, J. D. (2005). Rational monoclonal antibody development to emerging pathogens, biothreat agent and agents of foreign animal disease: The antigen scale. *The Veterinary Journal*, 170(2), 193-211.
- Bledsoe, G. E., & Rasco, B. A. (2002). Addressing the risk of bioterrorism in food production. *Food Technology*, 56(2), 43-44, 46-47.
- Blyn, L. B. (2006). Biosensors and food protection. *Food Technology*, 60(2), 36-41.
- Brewer, N. T., Chapman, G. B., Gibbons, F. X., Gerrard, M., MaCaul, K.D., and Weinstein, N. D., (2007). Meta-analysis of the relationship between risk perception and health behavior:the example of vaccination. *Health Psychology*, 26(2), 136-145.
- Bruemmer, B. (2003). Food biosecurity. *Journal of American Dietetic Association*, 103(6), 687-691.
- Bryant, C. M., McEntire, J., & Newsome, R. (2005). Defending the food supply. *Food Technology*, 59(8), 64-65, 67, 68, 71, 73.
- Campis L. K., Pretice-Dunn, S., & Lyman, R. D. (1989). Coping appraisal & parents' intentions to inform their children about sexual abuse: A protection motivation theory analysis. *Journal of Social & Clinical psychology*, 8, 304-316.
- Chambliss, C. A., & Murray, E. J., (1979). Efficacy attribution, locus of control, and weight loss. *Cognitive Therapy and Research*, 3, 349-353.
- Cohen, J., Cohen, P., West, S. G., Aiken, L. S., (2002). *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences* (3rd ed.). Lawrence Erlbaum Associates: Mahwah, NJ.
- Das, E. H. H., Wit, J. B. F.,& Stroebe, W. (2003). Fear appeals motivate acceptance of action recommendations: Evidence for a positive bias in the processing of persuasive messages. *Personality and social Psychology Bulletin*, 29(5), 650-664.

- Dillman, D.A. (2000). *Mail and Internet Surveys: The Tailored Design Method* (2Ed). New York, NY: John Wiley & Sons, Inc.
- Donovan, D. M., & Marlatt, G. A. (Eds.) (1988). *Assessment of addictive behaviors*. New York: Guilford Press.
- Epstein, J. A., Bovine, G. J., Diaz, T., & Toth, V. (1995). Social and personal factors in Marijuana use and intentions to use drugs among inner city minority youth. *Development and Behavioral Pediatrics*, 16, 14-20.
- Floyd, D., L., Prentice-Dunn, S., & Rogers, R. W. (2000). A meta-analysis of research on protection motivation theory. *Journal of Applied Social Psychology*, 30, 407-429.
- Fornell C. & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18, 39-50.
- Gerald, B. L., & Perkin, J. E. (2003). Position of the American Dietetic Association: Food and water supply. *Journal of American Dietetic Association*, 103(9), 1203-1218.
- Gidron, Y., McGrath, P. J., & Goodday, R. (1995). The physical and psychosocial predictors of adolescents' recovery from oral surgery. *Journal of Behavioral Medicine*, 18, 385-399
- Glynn, S. M., & Ruderman, A. J., (1986). The development and validation of an eating self-efficacy scale. *Cognitive Therapy and Research*, 10, 403-420
- Griffeth, R. W., Rogers, R. W. (1976). Effects of fear-arousing components of driver education on students' safety attitudes and simulator performance. *Journal of Educational Psychology*, 68, 501-506.
- Hair, J. A., Anderson, R. E. Tatham, R. L. and Black, W. C. (1998). *Multivariate Data Analysis* (5th ed.), Prentice Hall, Upper Saddle River, NJ.
- Hartenian, L. S., Bobko, P., & Berger, P. K., (1993). An empirical validation of bipolar risk perception scaling methods. *Journal of Applied Social Psychology*, 23(5), 335-351.
- Hendrick, C., Giesen, M., & Borden, R. (1975). False physiological feedback and persuasion: Effect of fear arousal vs. fear reduction on attitude change. *Journal of Personality*, 43, 196-214.
- Higbee, K.L. (1969). Fifteen years of fear arousal: Research on threat appraisals: 1953-1968. *Psychological Bulletin* 72, 426-444

- Janis, I.L. (1967). Effects of fear arousal on attitude change: Recent developments in theory and experimental research. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 3, pp. 166-225). New York: Academic Press.
- Kantola, S. J., Syme, G. J., & Nesdale, A. R. (1983). The effects of appraised severity and efficacy in promoting water conservation: An informational analysis. *Journal of Applied Social Psychology*, 13, 164-182.
- Kaplan, R. M., Atkins, C. J., & Reinsch, S. (1984). Specific efficacy expectations mediate exercise compliance in patients with COPD. *Health Psychology*, 3, 223-242
- Kim, K. (2003). National restaurant association says Food & Drug Administration's proposed one-size-fits-all risk approach may have negative impact on industry, economy. *Nation's Restaurant News*, 39(14), 1-6.
- Kulik, J. A., & Mahler, H. I. M. (1987). Health status, perceptions of risk, and prevention interest for health and nonhealth problems. *Health Psychology*, 6, 15-27.
- Lazarus, R. S., & Folkman, S., (1987). Transactional theory and research on emotions and coping. *European Journal of Personality*, 1, 141-170
- Leventhal, H. (1970). Findings and theory in the study of fear communications in L. Berkowitz (Ed.) *Advances in experimental social psychology* (Vol. 5, pp. 119-186). New York, NY: Academic.
- Levin, A. (Mar. 2007). Back to basics: food safety ABCs. (cover story). *Foodservice Equipment & Supplies*, 60(3), 22-30.
- Litt, M. D. (1988). Self-efficacy and perceived control: Cognitive mediators of pain tolerance. *Journal of Personality and Social Psychology*, 54, 149-160.
- Manning, M. M. & Wright, T. L. (1983). Self-efficacy expectancies, outcome expectancies, and the persistence of pain control in childbirth. *Journal of Personality and Social Psychology*, 45, 421-431.
- Marlett, G. A., & Gordon, J. R. (Eds.). (1985). *Relapse prevention: Maintenance strategies in the treatment of addictive behaviors*. New York: Guilford Press.
- Meadows, M. (2004). The FDA and the fight against terrorism. [Electronic version]. *FDA Consumer Magazine*, 38(1)Retrieved May 25th, 2006,

- Melamed, S., Rabinowitz, S., Feiner, M., Weisberg, E., & Ribak, J. (1996). Usefulness of the protection motivation theory in explaining hearing protection device use among male industrial workers. *Health Psychology, 15*(3), 209-215.
- Meyerson, L. A., & Reaser, J. K. (2002). Biosecurity: Moving toward a comprehensive approach. *BioScience, 52*(7), 593-600.
- Milne, S. E., Shhnan, P., & Orbell, S. (2000). Prediction and intervention in health-related behaviour: A meta-analysis review of protection motivation theory. *Journal of Applied Social Psychology, 30*, 106-143.
- Mulilis, J. P., & Lippa, R. (1990). Behavior changes in earthquake preparedness due to negative threat appeals: A test of protection motivation theory. *Journal of Applied Social Psychology, 20*, 619-638.
- Nunnally, J.C. (1978). *Psychometric theory*. New York:NY:McGraw-Hill, Inc.
- Peregrin, T. (2002). Bioterrorism and food safety: What nutrition professionals need to know to educated the american public. *Journal of American Dietetic Association, 102*(1), 14-16.
- Prentice-Dunn, S., & Rogers, R. W. (1986). Protection motivation theory and preventive health: Beyond the health belief model. *Health Education Research, 1*, 153-161.
- Reeve, L., Stevenson, P., & Wooton, C. (2006). *The AIB international guide to food defense: For food retail and food service operations* (K. Beach & R. Wheeler, Eds.). AIB International: Manhattan, KS.
- Rogers, R. W. (1975). A protection motivation theory of fear appeals and attitude change. *The Journal of Psychology, 91*, 93-114.
- Rogers, R. W. (1983). Cognitive and physiological processes in fear appeals and attitude change: A revised theory of protection motivation. In B. L. Cacioppo & L. L Petty (Eds.), *Social psychophysiology: A sourcebook* (pp. 153-176). London, UK: Guilford.
- Schafer, R. B., Schafer, E., Bultena, G. L. & Hoiberg, E. O. (1993) Coping with a health threat: A study of food safety. *Journal of Applied Social Psychology, 23*, 386-394.
- Schwarzer, R. (1992). Self-efficacy in the adoption and maintenance of health behaviors: Theoretical approaches and a new model. In R. Schwarzer (Ed.), *Self-efficacy: Thought control of action* (pp. 217-243). Washington, DC: Hemisphere.
- Slater, M. D. (1989). Social influences and cognitive control as predictors of self-efficacy and eating behavior. *Cognitive Therapy and Research, 13*, 231-245.

- Smith-Klohn, L., & Rogers, R. W. (1991). Dimensions of severity of health threats: The persuasive effects of visibility, time of onset, and rate of onset on young women's intentions to prevent osteoporosis. *Health Psychology*, 10, 323-329.
- Strong R. & Stamey, J. (Sep. 2004). Creating a food safety net. *Food Management* 39(10), 72, 76.
- United States Department of Agriculture. (2003). A biosecurity checklist for school foodservice Programs: Developing a biosecurity management plan. Available at: <http://schoolmeals.nal.usda.gov/Safety/biosecurity.pdf>. Accessed September, 2004.
- United States Department of Health and Human Services. (n.d.). Budget documents & information. Retrieved April 17, 2005 from <http://www.hhs.gov/budget/docbudget.htm>
- United States Food and Drug Administration. (2003). Retail Food Stores and Food Service Establishments: Food Security Preventive Measures Guidance (Final Guidance). Retrieved September 3, 2004 from <Http://www.cfsan.fda.gov/~dms/secgui11.html>
- Weinberg, r. S., Hughes, H. H., Critelli, J. W., England, R., & Jackson, A. (1984). Effects of preexisting and manipulated self-efficacy on weight loss in a self-control program. *Journal of Research in Personality*, 18, 352-358.
- Weinstein, N. D. (1987). Unrealistic optimism about illness susceptibility: Conclusions from a community-wide sample. *Journal of Behavioral Medicine*, 10, 481-500.
- Weinstein, N. D. (1993). Testing four competing theories of health-protective behavior. *Health Psychology*, 12, 324-333
- White, P. (2002). Food security. *School Foodservice and Nutrition*, 56(8), 42-46.
- Witte, K., Berkowitz, J. M., Cameron, K. A., & McKeon, J. K. (1998). Preventing the spread of genital warts: Using fear appeals to promote self-protective behaviors. *Health Education and Behavior*, 25, 571-585.
- Wolf, S., Gregory, W. L., & Stephen, W. G. (1986). Protection motivation theory: Prediction of intentions to engage in anti-nuclear war behaviors. *Journal of Applied Social Psychology*, 16, 310-321.
- World Health Organization. (2002). Terrorist threats to food: Guidance for establishing and strengthening prevention and response systems. Retrieved August 4, 2004 from http://www.who.int/foodsafety/publications/fs_management/terrorism/en/

- Wurtele, S. K. & Maddus, J. E. (1987). Relative contributions of protection motivation theory components in predicting exercise intentions and behavior. *Health Psychology*, 6, 453-466.
- Yoon, E. & Shanklin, C.W. (2007a). Food security practice in Kansas schools and healthcare facilities. *The Journal of American Dietetic Association*, 107(2), 325-329.
- Yoon, E. & Shanklin, C.W. (2007b). Implementation of food biosecurity management plan against food terrorism in on-site foodservice operations. *Journal of Hospitality and Tourism Research*, 31(2), 224-240.

CHAPTER 6 - Summary and Conclusions

This chapter summarizes the major findings of the study. Theoretical and practical implications are discussed along with limitations and suggestions for future study.

Concerns about threats to the safety and security of the food supply have dramatically increased in the United States (U. S.) since 2001. Food has recently received increased attention for its potential as a bioterrorism vehicle. Until 2001, food safety efforts in the U. S. had mainly focused on accidental contamination of food and water. However, threats to the food and water supply can arise from several sources such as disasters, characteristics of food ingredients (allergens, genetically modified organisms, imported food), or food safety/sanitation matters. Compared to the later two, the foodservice industry and the U. S. governments are underprepared for threats related to disasters, especially intentional (terrorism) disasters (Bledsoe & Rasco, 2002; Bryant, McEntire, & Newsome, 2005; Hollingsworth, 2002; Stauffer, 2002; White, 2002). Many foodservice directors have developed and implemented disaster management plans and crisis management plans to address natural disasters. However, these plans do not address how to deal with disasters that result from someone's intention to contaminate the food supply and cause harm to consumers. Therefore, a management plan designed specifically to prepare foodservice to manage an intentional food contamination incident should be developed and implemented. Foodservice directors should be aware of the risks they are facing and be prepared for any possible threats because they are the last control point in the food chain. Foodservice operations especially those who serve the most vulnerable populations, including children, elderly, and patients, should pay more attention to their preparedness for food terrorism threats because an attack will have more impact on these populations. This study focused on food terrorism issues in school and healthcare foodservice operations.

The purpose of this study was to investigate foodservice directors' intentions to implement a food biosecurity management plan in their operations. Protection motivation theory (PMT) was used to measure directors' implementation intentions. The protection motivation theory is a fear appeal model that was developed by Rogers (1975; 1983) to predict or to persuade an individual's behavior. According to PMT, when an individual faces a threat, two cognitive appraisal phases – threat appraisal and coping appraisal – mediate the choice of a

coping behavior. In order to persuade individuals to perform preventive behaviors, both appraisal phases should be high enough to form protection motivation (Rogers, 1983). Using the constructs and concepts included in the PMT, the study measured foodservice directors' risk perceptions of food terrorism, their perceptions about the effectiveness of a defensive management plan and their level of motivation and intention to implement a food defense management plan in their operations.

The specific research objectives were: (1) to explore on-site foodservice directors' risk perception associated with a food terrorism attack, (2) to examine on-site foodservice directors' perceived effectiveness of a food defense management plan, (3) to test protection motivation theory in the business setting, (4) to ascertain whether the protection motivation forms as a function of the foodservice directors' risk perception, (5) to provide a detailed explanation of the food defense management plan. These specific objectives will be discussed in detail later in this chapter, and (6) to explore the extent to which healthcare and school foodservice directors had implemented some critical preventive practices.

Based on previous PMT literature and food terrorism/defense related resources, a draft questionnaire was developed. Before pilot testing, the questionnaire was reviewed by 15 experts, including food safety and security researchers in higher education institutions, local health department representatives, and foodservice directors. All of the measurement items related to the PMT constructs and the measurement items developed to investigate current practices were measured using a 7-point Likert type scale. The finalized questionnaire was sent to 1100 school foodservice directors and 1100 healthcare foodservice directors in spring 2007. Twenty-five questionnaires were returned as undeliverable, 16 from healthcare and 9 from schools. A total of 449 usable questionnaires were received. Based on delivered questionnaires, overall response rate was 20.64%. School foodservice directors had a higher response rate ($n=254$; 23.28%) than healthcare foodservice directors ($n=195$; 17.99%). Demographic characteristics were similar across the two groups but several differences were found. Foodservice directors in healthcare foodservice were more likely to be male (33.8% vs. 21.3%, $\chi^2 = 9.175$, $p = 0.002$), to be registered dietitians (57% vs. 31.9%, $\chi^2 = 29.239$, $p = 0.00$), and to have well documented crisis management plans in their operations (72.3%, $\chi^2 = 16.34$, $p = 0.00$) than the school foodservice directors. Since the foodservice operations in the school districts with enrollments of 7500 or more were included in the study, the sizes of operations were very different. As a result,

comparisons of operational characteristics between school foodservice operations and healthcare foodservice operations could not be used to determine inferences between the two groups.

Findings of the study

Major Findings

This study addressed important issues that have not previously been studied in the foodservice industry: how foodservice directors perceive food terrorism and implementation of a food defense management plan, how much they are motivated to implement a food defense management plan, and how likely they will implement such a plan. Descriptive statistics were performed to investigate their perceptions, motivations and intentions independently.

Risk Perception (severity and vulnerability)

Foodservice directors perceived food terrorism as a serious threat in the U.S. (5.59 ± 1.28); they thought that if intentional food contamination occurred in their own operations, it would have a very serious impact on their businesses ($5.87 \pm 1.21 \sim 6.61 \pm 0.80$). Study participants agreed that the food supply chain in the U.S. is at risk of a terrorist attack (5.61 ± 1.12). The respondents do not strongly believe that the food industries are at higher risk of attack than other industries (4.54 ± 1.34) and that a foodservice operation is likely to be a target of the attack (4.55 ± 1.25). Although they somewhat agreed that they were concerned about the intentional contamination of food in their operations (5.05 ± 1.37), they tended to somewhat disagree with the statement, “It is likely that someone will attack my operation” (3.31 ± 1.22). The respondents were fearful about a food terrorism attack. The level of the fear was somewhat greater when they responded to specific items related to their own operations ($6.20 \pm 1.14 \sim 6.47 \pm 0.82$) than when asked to rate their fear of food terrorism (6.00 ± 1.22). Therefore, Hypothesis 1: Foodservice directors perceive a significant amount of threat of possible bioterrorism attacks was supported.

Perceptions related to implementation of a food defense management plan

Overall, respondents perceived that implementation of a food defense management plan would be effective to address the food terrorism issues in foodservice operations (5.73 ± 0.92). Respondents indicated implementing a food defense management plan would be somewhat time

consuming (4.89 ± 1.44). They somewhat disagreed that additional employees would be required (3.36 ± 1.50) and that it would be costly to implement a food defense plan (3.87 ± 1.49).

The study participants perceived moderate level of self-efficacy and of operational efficacy for the implementation of a food terrorism management plan. They somewhat agreed that they and their operations are able to implement a food defense management plan (5.25 ± 1.17 and 5.19 ± 1.15 , respectively). They believed that agreement among upper management team will affect the decision of whether or not they implement a food defense management plan (5.96 ± 1.04). They indicated that there would be limited resistance among their employees to implement a new management plan (4.10 ± 1.53). They also responded that their employees are neutral to the operational changes (3.24 ± 1.46) and adopting new policies or procedures (3.93 ± 1.41).

Motivation and Implementation Intention

Foodservice directors were highly motivated to avoid a food terrorism risk and to protect their operations ($6.28 \pm 0.86 \sim 6.75 \pm 0.57$). Additional items measuring motivation to seek the information on how to develop and implement a food defense management plan revealed that the foodservice directors want more detailed information about a food defense management plan (6.61 ± 1.02) and developing and implementing a food defense management plan (6.10 ± 1.01). Respondents indicated interest in participating in a food defense seminar or training (5.90 ± 1.18). In addition, they are willing to spend resources to implement a food defense management plan (5.49 ± 1.34).

The respondents agreed that they will implement a food defense management plan in their operations (5.44 ± 1.23). Approach motivation (6.53 ± 0.55) and avoidance motivation (6.54 ± 0.60) were very strong, however, foodservice directors' intention to implement a food defense plan was low.

The Model Testing

The study also proposed six hypotheses to test simultaneous causal relationships among PMT constructs. This model examined causal relationships between foodservice directors' motivation to protect their operations and the following variables: perceptions of severity and vulnerability of food terrorism, perceptions of effectiveness of a food defense management plan, barriers to implementing a food defense management plan, and directors' perceived ability to

implement the plan. The causal relationship between the directors' motivation and their intention to implement the plan was tested concurrently. Results of hypotheses testing revealed the following:

H2: Foodservice directors with higher protection motivation have higher intention to implement a food defense management plan. (Supported)

H3: When the foodservice directors perceive food terrorism as a severe risk, they have higher motivation to implement a food defense management plan. (Supported)

H4: When the foodservice directors perceive a food terrorism attack as highly possible, they have higher motivation to implement a food defense management plan. (Supported)

H5: Perceived effectiveness of a food defense management plan positively affects the foodservice director's protection motivation. (Supported)

H6a: Perception of the director's ability to implement a food defense management plan positively affects the foodservice director's protection motivation. (Not Supported)

H6b: Perception of the operational ability to implement a food defense management plan positively affects the foodservice director's protection motivation. (Supported)

H7: Perceived barriers to implementing a food defense management plan negatively affect the foodservice director's protection motivation. (Not Supported)

The hypothesized relationships among PMT constructs were tested simultaneously in a structural equation model. Goodness-of-fit indices ($\chi^2 = 1219.81$; $df = 395$; $\chi^2/df = 3.09$; $P = .000$; $RMSEA = 0.068$; $CFI = 0.87$; $NFI = 0.82$; $TLI = 0.86$; $PRATIO = 0.91$) showed that the proposed structural equation model fits the data. These goodness-of-fit indices captured by the AMOS suggested that this model was able to explain the on-site foodservice directors' protection motivation. Based on significant T-values at alpha level 0.05, all hypotheses were supported except Hypotheses 6a and 7. Motivation was found to strongly affect foodservice directors' implementation intention (H2: $\beta = .49$, $t = 8.17$, $p = <.01$). Most of the PMT constructs affected the motivation and the implementation intention except the self-efficacy and the response cost constructs. Perceived operational efficacy had the strongest effect on motivation of all PMT variables (H6b: $\gamma = .54$, $t = 4.33$, $p = <.01$) followed by perceived vulnerability (H4: $\gamma = .24$, $t =$

4.35, $p < .01$). Perceived response efficacy (H5: $\gamma = 0.16$, $t = 2.74$, $p < .01$) and perceived severity (H3: $\gamma = 0.12$, $t = 2.14$, $p = 0.03$) also positively affected the protection motivation. However, perception of their own ability to implement a food defense management plan (H6a: $\gamma = 0.003$, $t = 0.05$, $p = 0.96$) and perception on response cost (H7: $\gamma = -0.06$, $t = 1.04$, $p = 0.30$) did not affect the foodservice directors' protection motivation.

In other words, motivation to protect the operation against food bioterrorism is higher when directors perceived their operations are able to implement a food defense management plan, perceived a higher level of food terrorism risk (severity and vulnerability), and rated the effectiveness of a food defense management plan in protecting the operation high. In turn, a high level of motivation to protect the operation led to higher level of implementation intention.

Other Findings

The study also investigated how frequently 12 critical preventive measures are currently practiced in foodservice operations. The most frequently performed practices was “our operation purchases all food ingredients, food products, packaging materials, and other foodservice supplies only from reputable suppliers who have appropriate permits or licenses” (6.89 ± 0.34) and the least frequently performed practice was “our operation trains all employees about the food biosecurity management plan” (3.19 ± 1.93). Among these 12 practices, two were more frequently practiced in schools and three were in hospitals. School foodservice operations indicated that they checked their job candidate's background ($t = 2.58$, $p = 0.01$) and controlled and secured their facilities ($t = 2.31$, $p = 0.02$) more frequently than hospital foodservice operations did. Healthcare foodservices operations were more likely to use clear identification of personnel ($t = 4.12$, $p = 0.00$), to control former employee's accessibility to the operation ($t = 2.48$, $p = 0.01$), and to have more controlled access to their utilities ($t = 3.07$, $p = 0.00$).

A set of one-way ANOVAs and post hoc tests was performed among six regions the USDA compliance office categorization (USDA, n.d.) to elucidate their differences in perceptions, motivations, intentions, and current practices. Foodservice directors in the Western region were less likely to agree to the statement, “I want to reduce a food terrorism risk as much as possible” than directors in the Southern (mean difference = 0.46, $p = .015$) and Central (mean difference = 0.56, $p = .018$) regions. Among the 12 current practices, four practices were performed more frequently by foodservice operations in the Southern region than some of the

other regions. The four practices were “Our operation accounts for all keys, uniforms, and identification badges provided to former employees” (Mean difference between Southern and Eastern = 0.88, $p = 0.00$); “Our operation controls access of all visitors and unauthorized persons to the storage and production areas” (Mean difference between Southern and Eastern = .56, $p = .05$; Mean difference between Southern and Western = 0.77, $p = 0.04$); “Our operation controls, monitors and secures all access points into the foodservice facility including all food product, food ingredient, and chemical storage areas with alarms, cameras, locks, fences, or other security hardware that meet national and local fire and safety codes” (Mean difference between Southern and Central = 1.065, $p = 0.03$); and “Our operation maintains a contact list, updated monthly, of local authorities such as the police and fire departments, who should be notified in case of a biosecurity incident and distributes the list to the foodservice staff” (Mean difference between Southern and Northern = 1.27, $p = 0.04$).

Some foodservice directors had attended seminar or training sessions provided by professional associations or organizations, governmental entities, or private companies. Healthcare foodservice directors ($n = 29$) were more likely to have attended a seminar or training session which was provided by professional associations or organizations (58.62%) while school foodservice directors ($n = 52$) were more likely to have attended training provided by governmental entities (57.69%). The professional association/organization identified most often were those from which the sample was selected (Child Nutrition Association, Healthcare Foodservice Management, and American Society for Healthcare Foodservice Administrators). Federal governmental units providing training attended by respondents were USDA, FDA, FBI, Department of Defense, Department of Homeland Security, and US Army and non-federal governmental entities include state, county, city, or local health departments.

Summary and Discussions

The adoption of the protection motivation theory successfully guided the researcher to investigate foodservice directors’ risk perception of food terrorism, perception of a food defense management plan, and how these perceptions affect their motivation to protect their operations which directly influenced intention to implement a food defense management plan. On-site foodservice directors were willing to implement a food defense management plan in the following situations: when they thought a food terrorism attack would damage the operation

severely, when they perceived the possibility that food terrorism would occur in their own operations and when they regarded that implementing a defensive management plan was effective to prevent the threat and did not require a lot of resources.

Foodservice directors were highly motivated to avoid a terrorism risk and protect their operations. In contrast, their intentions to implement a food defense management plan were somewhat lower than their motivation level. They agreed that implementation of a defensive management plan is an effective approach to prevent a terrorist attack. Foodservice directors thought implementing such a plan would require some but not a lot of monetary or non-monetary resources. The confidence level that the directors themselves and their operations had that they could implement a food defense management plan in their operations was moderate.

On-site foodservice directors perceived that the result of a food terrorism attack would be very severe. They somewhat agreed that the food supply chain in the US was at high risk of a terrorist attack and that someone would attack a foodservice operation but they were more likely to disagree that their operation could be a target for such attack. This finding can be explained by some of the cognitive bias theories related to risk perception. People are likely to underestimate the probability that something really bad can happen to them than to others and to overestimate the probability that something nice can happen to them. Unrealistic optimism might cause this result. Unrealistic optimism refers to the phenomenon that people systematically overestimate the probability that good things will happen to them and underestimate the probability that bad things will happen to them (Weinstein, 1987).

Vulnerability perception influenced the protection motivation more than severity perception did. This was similar to result of other previous PMT studies. Brewer, Chapman, Gibbons, Gerrard, MaCaul, and Weinstein (2007) reported that the magnitude of the associations between behavior and perceived risk likelihood or susceptibility was somewhat larger than between behavior and severity perception in many previous studies on risk perception and health behavior. In their meta-analyses, Milne et al. (2000) found that the association between severity and intention was small while the association between the vulnerability and intention was somewhat larger. Previous studies found that coping appraisal had a somewhat stronger impact on the behavior or the behavioral intention (Floyd et al, 2000; Milne et al., 2000).

Meta-analysis study performed by Floyd et al. in 2000 revealed that the variables related to coping had slightly stronger relations with the adaptive behaviors than did the variables

measuring the threat. Milne et al (2000) reported similar results. Among these coping appraisal variables, the self-efficacy had the strongest association with intention, concurrent behavior and subsequent behavior (Milne et al., 2000). Even though the present study failed to find a significant association between self-efficacy and protection motivation, this study actually measured protection motivation while other previous PMT studies just assumed that the protection motivation was an intermediate state that was formed by threat appraisal and coping appraisal processes. As a result, previous studies did not review the relationships between antecedent appraising variables and their protection motivation but between those and behavioral intention, current behavior, or/and subsequent behavior. Therefore, comparisons between these previous studies, which did not actually measure and include the motivation construct, and the result of this study should be made with caution. Self-efficacy in this study may not affect the motivation but still influence the behavioral intention like it did in the other PMT studies. Significant positive correlation coefficients between the self-efficacy and intention were discovered. The magnitude was somewhat smaller than the correlation coefficients between intention and all the other constructs except severity perception. However, because the conceptual model that this study proposed did not allow antecedents to directly affect the intention, the direct relationship between these five threat and coping appraisal variables and the implementation intention was not tested.

Another inference can be made from the unique characteristics of this study. PMT had been tested in various situations targeting individual behavioral changes related to the individual's well being (e.g. Bandura, Cioffi, Taylor, & Brouillard, 1988; Bernier & Avard, 1986; Chambliss & Murray, 1979; Glynn & Ruderman, 1986; Kaplan, Atkins, & Reinsch, 1984; Slater, 1989; Weinberg, Hughes, Critelli, England, & Jackson, 1984). However, PMT had never been tested in a group setting. In the group setting, the decision maker and the object of protection do not always coincide. Unlike the individual setting, the protection motivation evoked by the decision maker will not only affect himself or herself but others involved in the group. More importantly, in many cases the decision may not be made by an individual but by groups of people (i.e. upper management team or a board of stockholders, etc.). In the foodservice industry, the objects of protection from bioterrorism attack range from the direct stakeholders, such as the clients/customers and employees of the operation, to the general public. As a result, self-efficacy perception (whether a foodservice director perceive that they can

implement a food defense management plan in this study) might not significantly affect the protection motivation (the foodservice directors' motivation to avoid the terrorism risk and to protect their operations) as much as it does in other individual health threatening behaviors. Moreover, operational efficacy strongly affected the protection motivation while self-efficacy did not affect it. Therefore, it could also be concluded that the perception of the decision makers' own ability, which had been the strongest contributor on the PMT in individual setting, does not form the protection motivation but the perception of the organization's ability to follow the recommended behavior performs just like 'self-efficacy' in a group or business setting.

Implications and Suggestions for the Future of Study

Some theoretical implications can be made based on the findings of the study. This study used PMT in a group and a business setting that had never been accomplished before. The result of this study showed that PMT can be used in a group setting with caution especially for measuring the self-efficacy construct. Since the decision maker and the actual behavior cannot be identical and there can be various people involved in a decision making process, measuring the perceived ability to follow the recommended behavior is more sophisticated. From the stage of scale development to the stage of final model decision, future PMT studies in a group or a business setting should pay extra attention to the efficacy construct.

Another important theoretical implication is that the protection motivation can actually be measured instead of just assumed that it was formed by measuring perceptions related to the risk and the coping behavior. In the previous empirical PMT based studies, the protection motivation was just a name of the intermediate status assumed to be formed by threat appraisal and coping appraisal. Including the actual motivation construct will increase the predictive power of the model. Therefore, it is strongly recommended that future studies measure protection motivation directly.

This study identified foodservice directors' intentions to implement a food defense management plan. The result of this study provided useful information that governmental agencies and professional associations can use to identify communication mechanisms and training strategies to help foodservice operations adopt food defense management plans. Understanding the decision making mechanism is important. Government agencies, policy makers, practitioners, and researchers can use this information to develop more effective

messages that will promote implementation intention for campaigns, flyers, seminars, or trainings. The result of this study will help in developing effective persuasion messages that will motivate foodservice directors to implement a food defense management plan in their operations. In fact some governmental agencies, such as USDA and FDA, have published guidelines for developing and implementing a food defense management plan. However, these agencies have not identified ways to motivate foodservice directors to implement the guidelines.

Results of this study can be used to identify components of messages designed to enhance foodservice directors' intention to implement a food defense management plan. For example, when designing communication resources, the results of this study suggest important aspects of the message developed to enhance foodservice directors' intention to implement a food defense management plan. Educational and informational resources related to intentional food contamination and its defense should emphasize operational efficacy, possibility perception, response efficacy, and severity perception since these were influential factors on protection motivation. Since the self-efficacy is not as influential as was found in previous PMT studies, messages developed to increase self-efficacy may be less effective than those developed to increase operational efficacy and risk susceptibility perception. Thus, messages should focus on how implementing a food defense plan can be effective. The messages should be designed to increase foodservice directors' awareness of risk perception toward a food terrorism event. However, further quasi-experimental or experimental studies should be conducted to validate this argument by differentiating these different perceptions successfully.

The study found that on-site foodservice directors in the U.S. believed that a food terrorism threat would result severe consequences; however, their perception of the possibility of a food terrorism attack was not high. Even though the perceived odds of attack were moderate, foodservice directors still express their fear of food terrorism. Therefore, it is strongly recommended that directors need to increase their awareness of food terrorism and be motivated to develop and implement a food defense management plan. Foodservice directors also perceived some barriers in developing and implementing a plan. Time required to develop and implement such a plan was perceived as the most significant barrier. Therefore, informational resources and training sessions should explain the step-by-step process of implementing a food defense plan with a feasible time line. Even though they considered implementing a food defense management plan as somewhat difficult and complicated, the directors believed that they are capable of

implementing a plan in their operations. The foodservice directors indicated that consensus among their upper management was more important than other employees when implementing a food defense management plan in their operations.

U.S. on-site foodservice directors were highly motivated to secure their operations, protect their stakeholders and avoid or, at least, reduce a food terrorism risk. They expressed a need for more information about a food defense management plan and interest in participating in educational programs related to food defense. Moreover, they were willing to spend time and to expend resources to implement a food defense management plan. The researcher recommends that governmental entities and academia develop and provide informational materials and training sessions to address the educational needs of foodservice directors.

The foodservice directors indicated that they would implement a food defense management plan in their operations at some point in the future. However, the foodservice directors' behavioral intention was somewhat lower than their motivation. Future studies should further investigate what affects this phenomenon. One of possible explanations would be related to barriers to implementing a management plan. Knowledge of these barriers would provide better insights into how to increase the foodservice directors' intention to implement a food defense management plan. More efforts should be made to decrease negative perceptions of implementing a food defense management plan.

Some of the preventive measures were already practiced in operations. Practices that are more likely to be included in their policies and procedures or are directly related to food and chemical handling were practiced more frequently than those related to physical securities (access controls), incident reporting (readily accessible contact numbers to local authorities), and food defense employee training. It is strongly recommended that when foodservice directors develop and implement a food defense management plan in their operations, they address these less frequently performed practices first. Some of these practices are relatively easy and inexpensive to implement and most important are the practices that need to be improved as soon as possible.

Detailed informational materials were already developed by several government agencies and private companies (e.g. FDA, 2003; USDA, 2003; AIB, 2005) and accessible on websites and published materials. Even though it is readily accessible, the problem is the message

recipients' willingness to study the materials and follow the recommendations. This study showed that the detailed lengthy introductory material cannot differentiate the message recipients' attitudes towards the food defense management plan. Therefore, for the purpose of increasing the awareness level these materials should be short but interesting enough to motivate foodservice directors to seek more information.

Implementing a food defense management plan is an addition to many responsibilities performed by foodservice directors. Therefore, to encourage directors to implement a food defense management plan, providing them with training on how to customize a food defense management plan or how to incorporate food defense practices into a part of their existing management systems will be necessary. For example, a food defense management plan could be incorporated into the operations' disaster management plan, crisis management plan, or Hazard Analysis and Critical Control Points plan.

Limitations of the Study

The results of this study should be interpreted with caution. As the first empirical study measuring protection motivation in a group setting, some of the measurement items did not measure the designated constructs. Even though it was revealed that the operational efficacy was one of the strongest influential constructs on the protection motivation, this construct had a low composite reliability and a discriminant validity issue. Therefore, the result of the study should be interpreted with extra caution. In addition, the response cost did not affect the protection motivation, which was supposed to affect the motivation significantly. Possible measurement error and response error issues were discussed in the result part of this manuscript. In order to confirm the findings of this study, future studies are strongly recommended to revise these measurement items.

Even though the sampling frame included operations in all regions of the U.S., many foodservice directors may not be members of one or more associations used in this study. Therefore, inferences cannot be made to foodservice directors who were not members of these associations. Moreover, the values and opinions shared among association members could possibly affect the results of the study. For school foodservice, this study only included school districts with enrollments more than 7500 students. Therefore, it is impossible to evaluate the likelihood of foodservice operations implementing a food defense management plan in smaller

school districts or in private schools. Further, size differences between hospital foodservice operations and school foodservice operations might affect the comparison between these operations.

The length of the questionnaire is also a limitation of this study. Even though the researchers offered incentives to increase response rate; a two-dollar donation to their choice of organization per returned usable response and summary of the study result, a higher response rate would be expected with a shorter questionnaire. Manipulation is another limitation. The study tried to differentiate the effectiveness perception of food defense management plan by providing more or less information about the concept to investigate whether the effectiveness perception affects their intention. However, these two forms did not successfully differentiate foodservice director's response effectiveness perception. Even though the manipulation was not the primary purpose of this research, it is strongly recommended for future studies to evaluate whether the effectiveness perception would affect the implementation intention and further, actual implementation. The result of this type of study will assist communication professional in developing messages that will promote foodservice directors to develop and implement a food defense management plan.

There were some problems with the way some of the operational characteristic questions were stated. Some of these questions were answered differently than requested. For example, the respondents were asked to provide number of full time equivalent employees (FTEs). However, several respondents provided the number of employees on their payroll rather the FTEs as requested. In case of school foodservice operations, because the answer was collected from the district director, some of them provided number of employees in entire district while others provided number of employees in the largest facility in the district or the average number of foodservice employees per school. This limited analysis of differences based on operational variables and other study constructs of interests.

Regional comparison could be another limitation. This study divided the operations to six regions based on the USDA compliance office. Therefore, the regional characteristic would be varied within each region too. Each region may not be homogenous. As a result, possibly, the aggregated characteristics of operations in regions may not be accurate for some operations. In order to make the study findings more meaningful and practical, future studies should investigate

each region separately. It will also help the each compliance office understand the operations in their region better.

Several food defense practices included in the government guidelines are currently being implemented. A future study is strongly recommended to elucidate how to effectively decrease foodservice directors' perceived burden about implementing a food defense management plan. The possible solution could be found by investigating the gaps between already implemented preventive measures and food defense specific practices that should be developed and implemented. In order to do this research, an anteceding study is necessary that closely investigates current practices. The results of these suggested studies may not be generalizable to many other operations because each foodservice operation has its own characteristics. However, results will provide insights to the foodservice industry about how to efficiently motivate foodservice directors to develop and implement a food defense management plan in their operations.

References

- Bandura, A., Cioffi, D., Taylor, C. B., & Brouillard, M. E. (1988). Perceived self-efficacy in coping with cognitive stressors and opioid activation. *Journal of Personality and Social Psychology*, 55, 479-488.
- Bernier, M. & Avard, J., (1986). Self-efficacy, outcome and attrition in a weight reduction program. *Cognitive Therapy and Research*, 10, 319-338.
- Bledsoe, G. E., & Rasco, B. A. (2002). Addressing the risk of bioterrorism in food production. *Food Technology*, 56(2), 43-44, 46-47.
- Brewer, N. T., Chapman, G. B., Gibbons, F. X., Gerrard, M., MaCaul, K.D., and Weinstein, N. D., (2007). Meta-analysis of the relationship between risk perception and health behavior: the example of vaccination. *Health Psychology*, 26(2), 136-145.
- Bryant, C. M., McEntire, J., & Newsome, R. (2005). Defending the food supply. *Food Technology*, 59(8), 64-65, 67, 68, 71, 73.
- Chambliss, C. A., & Murray, E. J., (1979). Efficacy attribution, locus of control, and weight loss. *Cognitive Therapy and Research*, 3, 349-353.
- Floyd, D., L., Prentice-Dunn, S., & Rogers, R. W. (2000). A meta-analysis of research on protection motivation theory. *Journal of Applied Social Psychology*, 30, 407-429.
- Glynn, S. M., & Ruderman, A. J., (1986). The development and validation of an eating self-efficacy scale. *Cognitive Therapy and Research*, 10, 403-420
- Hollingworth, P. (2002). Hot topics address terrorism, fickle consumers, and obesity. *Food Technology*, 56(8), 48-50, 52.
- Kaplan, R. M., Atkins, C. J., & Reinsch, S. (1984). Specific efficacy expectations mediate exercise compliance in patients with COPD. *Health Psychology*, 3, 223-242
- Milne, S. E., Shhrran, P., & Orbell, S. (2000). Prediction and intervention in health-related behaviour: A meta-analysis review of protection motivation theory. *Journal of Applied Social Psychology*, 30, 106-143.
- Rogers, R. W. (1975). A protection motivation theory of fear appeals and attitude change. *The Journal of Psychology*, 91, 93-114.

- Rogers, R. W. (1983). Cognitive and physiological processes in fear appeals and attitude change: A revised theory of protection motivation. In B. L. Cacioppo & L. L. Petty (Eds.), *Social psychophysiology: A sourcebook* (pp. 153-176). London, UK: Guilford.
- Slater, M. D. (1989). Social influences and cognitive control as predictors of self-efficacy and eating behavior. *Cognitive Therapy and Research*, 13, 231-245.
- United States Department of Agriculture. (2003). A biosecurity checklist for school foodservice Programs: Developing a biosecurity management plan. Available at: <http://schoolmeals.nal.usda.gov/Safety/biosecurity.pdf>. Accessed September, 2004.
- United States Food and Drug Administration. (2003). Retail Food Stores and Food Service Establishments: Food Security Preventive Measures Guidance (Final Guidance). Retrieved September 3, 2004 from <Http://www.cfsan.fda.gov/~dms/secgui11.html>
- Weinberg, r. S., Hughes, H. H., Critelli, J. W., England, R., & Jackson, A. (1984). Effects of preexisting and manipulated self-efficacy on weight loss in a self-control program. *Journal of Research in Personality*, 18, 352-358.
- Weinstein, N. D. (1987). Unrealistic optimism about illness susceptibility: Conclusions from a community-wide sample. *Journal of Behavioral Medicine*, 10, 481-500.
- White, P. (2002). Food security. *School Foodservice and Nutrition*, 56(8), 42-46.

Appendix A - Questionnaire

Section B: Perceptions about Food Terrorism and Food Defense Management Plan

INSTRUCTIONS: The following set of statements asks for **your perceptions regarding food terrorism**. Using a 7-point scale below (1: strongly disagree ~ 7: strongly agree), please indicate the extent to which you agree with the following statements by circling the number on the scale. Please express your honest opinion.

Strongly disagree 1	Disagree 2	Somewhat disagree 3	Neutral 4	Somewhat agree 5	Agree 6	Strongly agree 7
---------------------------	---------------	---------------------------	--------------	------------------------	------------	------------------------

	Disagree ←←←				Agree →→→		
1. Food terrorism is a serious threat in the U. S.	1	2	3	4	5	6	7
2. If someone intentionally contaminates food in my operation, my employees or customers will suffer from the attack.	1	2	3	4	5	6	7
3. If someone intentionally contaminates food in my operation, it will damage the reputation of my facility.	1	2	3	4	5	6	7
4. If someone intentionally contaminates food in my operation, it will take years for my operation to recover from the attack.	1	2	3	4	5	6	7
5. I am concerned about the intentional contamination of food in my operation.	1	2	3	4	5	6	7
6. The food supply chain in the U. S. is at risk of a terrorist attack.	1	2	3	4	5	6	7
7. Industries related to the food supply chain in the U. S. are at higher risk of terrorist attack than other industries.	1	2	3	4	5	6	7
8. It is likely that someone will attack a foodservice operation.	1	2	3	4	5	6	7
9. It is likely that someone will attack my operation.	1	2	3	4	5	6	7
10. Food terrorism is frightening.	1	2	3	4	5	6	7
11. A food terrorism incident in my operation would create fear.	1	2	3	4	5	6	7
12. A food terrorism incident in my operation would cause anxiety.	1	2	3	4	5	6	7
13. I would be frightened if a food terrorism incident occurred in my operation.	1	2	3	4	5	6	7
14. I would be nervous if a food terrorism act occurred in my operation.	1	2	3	4	5	6	7

INSTRUCTIONS: The following set of statements asks for **your perceptions regarding the food defense management plan**. Using a 7-point scale below (1: strongly disagree ~ 7: strongly agree), please indicate the extent to which you agree with the following statements by circling the number on the scale.

Strongly disagree 1	Disagree 2	Somewhat disagree 3	Neutral 4	Somewhat agree 5	Agree 6	Strongly agree 7
---------------------------	---------------	---------------------------	--------------	------------------------	------------	------------------------

Disagree Agree
 <<<< >>>>

- | | | | | | | | |
|--|---|---|---|---|---|---|---|
| 1. Foodservice operations that have implemented a food defense management plan will have a lower probability of a food terrorist attack than operations without such a plan. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. Foodservice operations that have implemented a food defense management plan will respond to a food terrorist attack more effectively than operations without such a plan. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. Foodservice operations that have implemented a food defense management plan will respond to a food terrorist attack more promptly than operations without such a plan. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4. Implementation of a food defense management plan will help prepare operations to respond to a food terrorist attack. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5. Implementing a food defense management plan will disturb routine work. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 6. Implementing a food defense management plan will require additional employees. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 7. Implementing a food defense management plan will be costly. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8. Implementing a food defense management plan will be time consuming. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

INSTRUCTIONS: The following set of statements asks **your perceptions regarding your ability to implement a food defense management plan in your operation.**

Using a 7-point scale below (1: strongly disagree ~ 7: strongly agree), please indicate the extent to which you agree with the following statements by circling the number on the scale.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
1	2	3	4	5	6	7

	Disagree ←←←←			Agree ⇒⇒⇒⇒		
1. I am able to implement a food defense management plan in my operation.	1	2	3	4	5	6 7
2. Implementing a food defense management plan is difficult.	1	2	3	4	5	6 7
3. Implementing a food defense management plan is complicated.	1	2	3	4	5	6 7
4. My operation is able to implement a food defense management plan.	1	2	3	4	5	6 7
5. Employees in my operation are likely to resist the implementation of a new management plan.	1	2	3	4	5	6 7
6. Employees in my operation adopt a new policy or procedure easily.	1	2	3	4	5	6 7
7. Employees in my operation dislike operational changes.	1	2	3	4	5	6 7
8. If upper management in my operation agrees to implement a food defense management plan, my operation will develop one.	1	2	3	4	5	6 7
9. I am not able to implement a food defense management plan in my operation.	1	2	3	4	5	6 7
10. I do not want to implement a food defense management plan in my operation.	1	2	3	4	5	6 7
11. I do not need to implement a food defense management plan in my operation.	1	2	3	4	5	6 7
12. Even if I implement the defense plan, it would not work anyway.	1	2	3	4	5	6 7
13. I do not care about a possible food terrorism attack at my operation.	1	2	3	4	5	6 7
14. It is unnecessary to worry about a food terrorism attack.	1	2	3	4	5	6 7
15. A food terrorism attack is unrealistic. It will not happen to the foodservice industry.	1	2	3	4	5	6 7

INSTRUCTIONS: The following sets of sentences will measure **your attitude toward food terrorism and a food defense management plan**. Please fill in the blank for following each statement by circling the number in each row that best represents your opinion.

Examples: If you think implementing HACCP is a very effective method for addressing food borne outbreaks in a foodservice operation, you will circle the number 1, 2, or 3 depending on how effective you perceive HACCP. If you think implementing HACCP is somewhat complicated to develop, you will circle -1, -2 or -3. See examples below.

"I think implementing HACCP is for addressing foodborne outbreaks in a foodservice operation."

ineffective : -3 : -2 : -1 : 0 : 1 : 2 : 3 : effective

complicated : -3 : -2 : -1 : 0 : 1 : 2 : 3 : easy to develop

"When I heard about food terrorism, my first instinct was to"

1. not want to think about it : -3 : -2 : -1 : 0 : 1 : 2 : 3 : want to think about it
2. not want to know more about it : -3 : -2 : -1 : 0 : 1 : 2 : 3 : want to know more about it
3. not want to do something extra to deal with it : -3 : -2 : -1 : 0 : 1 : 2 : 3 : want to do something to protect the operation

"I think a food defense management plan is for addressing food terrorism in a foodservice operation."

1. ineffective : -3 : -2 : -1 : 0 : 1 : 2 : 3 : effective
2. bad : -3 : -2 : -1 : 0 : 1 : 2 : 3 : good
3. undesirable : -3 : -2 : -1 : 0 : 1 : 2 : 3 : desirable
4. useless : -3 : -2 : -1 : 0 : 1 : 2 : 3 : helpful

Section C: Motivation and Intention to implement a food defense plan and to avoid food terrorism

INSTRUCTIONS: The following set of statements asks **your motivation toward implementing a food defense management plan in your operation and your motivation to avoid a food terrorism attack**. Using a 7-point scale below (1: strongly disagree ~ 7: strongly agree), please indicate the extent to which you agree with the following statements by circling the number on the scale.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
1	2	3	4	5	6	7

	Disagree ←←←←				Agree ⇒⇒⇒⇒		
1. I want to secure my operation.	1	2	3	4	5	6	7
2. I do not want to protect my employees from harmful events.	1	2	3	4	5	6	7
3. I do not want to protect my customers from harmful events.	1	2	3	4	5	6	7
4. I want my employees and customers to recognize that ensuring their safety is my operation's priority.	1	2	3	4	5	6	7
5. I want to avoid any food terrorism danger in my operation.	1	2	3	4	5	6	7
6. I do not want to reduce a food terrorism risk as much as possible.	1	2	3	4	5	6	7
7. I want to stay away from situations that could harm employees and customers.	1	2	3	4	5	6	7
8. I do not want anything bad to happen to my operation.	1	2	3	4	5	6	7
9. I want to have more information about a food defense management plan.	1	2	3	4	5	6	7
10. I want to know how to develop and implement a food defense management plan in detail.	1	2	3	4	5	6	7
11. I will participate in a seminar or training related to food defense.	1	2	3	4	5	6	7
12. I am willing to spend some resources (money, time, etc) to implement a food defense management plan.	1	2	3	4	5	6	7

INSTRUCTIONS: The following set of questions asks **your food defense management plan implementation intention for your operation**. Please indicate your answer by circling your answer choice for question 1 thru 2. For questions 3, 4 and 5, please indicate the extent to which you agree with the statements. Your response should reflect current practice in your foodservice operation.

1. My operation has already implemented a food defense management plan.
 - A. Yes (go to question 1-1)
 - B. No (go to question 2)

- 1-1. The food defense management plan in my operation is being continuously updated.
 - A. Yes (skip questions 2, 3, and 4 on this page and go to the next page)
 - B. No (skip questions 2, 3, and 4 on this page and go to the next page)

2. My operation is currently developing a food defense management plan with a specific timeline for implementation.
 - A. Yes (skip questions 2, 3, and 4 on this page and go to the next page)
 - B. No (please answer questions 3 and 4)

Strongly disagree 1	Disagree 2	Somewhat disagree 3	Neutral 4	Somewhat agree 5	Agree 6	Strongly agree 7
------------------------	---------------	------------------------	--------------	---------------------	------------	---------------------

	Disagree				Agree			
	←←←←				⇒⇒⇒⇒			
3. I will develop and implement a food defense management plan in my operation.	1	2	3	4	5	6	7	
4. I will develop and implement a food defense management plan in my operation within 3 years.	1	2	3	4	5	6	7	
5. At the present time, I have no intention of implementing a food defense management plan in my operation.	1	2	3	4	5	6	7	

Section D: Your Current Food Defense Practices

INSTRUCTIONS: The following set of statements asks your operations' **current practices** related to food defense. Using a 7-point scale below (1: Never ~ 7: Always), please indicate how often your operation perform these practices by circling the number on the scale.

Never	Seldom	Not very frequently	From time to time	Many times	Most of the time	Always
1	2	3	4	5	6	7

	Never ←←←←	Always ⇒⇒⇒⇒
1. Our operation inspects ingredient packages prior to use for evidence of tampering. (Examples of evidence are a broken seal or discoloration of food inside package).	1 2 3 4 5 6 7	
2. Our operation purchases all food ingredients, food products, packaging materials, and other foodservice supplies only from reputable suppliers who have appropriate permits or licenses.	1 2 3 4 5 6 7	
3. Our operation assigns an authorized person to verify and receive shipments both during business hours and after business hours.	1 2 3 4 5 6 7	
4. Our operation requires all job candidates to pass background security checks prior to hiring.	1 2 3 4 5 6 7	
5. Our operation trains all employees about the food biosecurity management plan.	1 2 3 4 5 6 7	
6. Our operation uses a system that ensures clear identification of foodservice personnel and their specific functions within the operation	1 2 3 4 5 6 7	
7. Our operation accounts for all keys, uniforms, and identification badges provided to former employees.	1 2 3 4 5 6 7	
8. Our operation controls access of all visitors and unauthorized persons to the storage and production areas.	1 2 3 4 5 6 7	
9. Our operation controls, monitors and secures all access points into the foodservice facility including all food product, food ingredient, and chemical storage areas with alarms, cameras, locks, fences, or other security hardware that meet national and local fire and safety codes	1 2 3 4 5 6 7	
10. Our operation restricts access to central controls for airflow, HVAC, water systems, electricity, and gas within foodservice areas.	1 2 3 4 5 6 7	
Our operation stores and secures hazardous chemicals outside of		
11. food preparation areas and trains employees to use chemicals properly to prevent food contamination and human exposure.	1 2 3 4 5 6 7	
12. Our operation maintains a contact list, updated monthly, of local authorities such as the police and fire departments, who should be notified in case of a biosecurity incident and distributes the list to the foodservice staff.	1 2 3 4 5 6 7	

Section E: Demographic Information (Healthcare Foodservice)

INSTRUCTIONS: Please answer the following questions about your operation and yourself. Circle your response choice or insert your response in the blank provided.

1. How many licensed beds are in your facility? _____ beds
2. On average, how many meals are served daily in your operation?
Breakfast: _____ Lunch: _____ Dinner: _____
3. Who operates the foodservice department?
A. Hospital (i.e. self-operated)
B. Outside contractor (please provide the name of the contractor _____)
4. What is your annual foodservice operating budget? \$ _____
5. How many employees are on your payroll? _____ FTEs
6. What is the maximum number of employees working per shift? _____
7. Does your operation have one or more employee(s) who is(are) responsible for food safety?
A. No B. Yes (If yes, how many? _____)
8. Does your operation have one or more employee(s) who is(are) responsible for food defense?
A. No B. Yes (If yes, how many? _____)
9. Has your foodservice operation been audited to evaluate the security level?
A. No B. Yes, internal auditing C. Yes, external by a government agency
D. Yes, external by consultant/company (If yes, when was the last audit? _____)
10. Does your operation have a crisis management plan?
A. No B. Yes, but no written document C. Yes, and it is well documented.
11. Have you ever attended a seminar or training related to food defense?
A. No
B. Yes (If yes, Please briefly describe about the seminar/training you attended in the blank below) _____
12. What is the title of your position? _____
13. How long have you held this position? _____ years
14. How many years have you been employed in foodservice? _____ years
15. Are you a Registered Dietitian (RD)? A. No B. Yes
16. In your position, can you influence changes in policy and protocols/practice?
A. No B. Yes
17. What is your age? _____
18. What is your gender? A. Female B. Male

19. What is your highest level of education completed?

- A. Less than high school
- B. High school
- C. Vocational institution
- D. Some college (e.g. Junior college, community college, etc.)
- E. Bachelor's degree
- F. Some graduate school
- G. Graduate degree (i.e. Master's or Doctoral)

Please check (✓) one of the organizations below to which you would like us to make our \$2 donation upon your participation in this study.

- ☐ Healthcare Foodservice Management
- ☐ American Society for Healthcare Foodservice Administrators
- ☐ School Nutrition Association
- ☐ March of Dimes
- ☐ The National Breast Cancer Foundation

- Thank you for your participation. Please mail questionnaire in the postage-paid envelop. -

Section E: Demographic Information (School Foodservice)

INSTRUCTIONS: Please answer the following questions about your operation and yourself. Circle your response choice or insert your response in the blank provided.

1. How many students are enrolled in your school district? _____
2. On average, how many meals are served daily? Breakfast: _____ Lunch: _____
3. Who operates the foodservice department?
 - A. School (i.e. self-operated)
 - B. Outside contractor (please provide the name of the contractor _____)
4. What is your annual foodservice operating budget? \$ _____
5. How many employees are on your payroll? _____ FTEs
6. What is the maximum number of employees working per shift? _____
7. Does your operation have one or more employee(s) who is(are) responsible for food safety?
 - A. No
 - B. Yes (If yes, how many? _____)
8. Does your operation have one or more employee(s) who is(are) responsible for food defense?
 - A. No
 - B. Yes (If yes, how many? _____)
9. Has your foodservice operation been audited to evaluate the security level?
 - A. No
 - B. Yes, internal auditing
 - C. Yes, external by a government agency
 - D. Yes, external by consultant/company (If yes, when was the last audit? _____)
10. Does your operation have a crisis management plan?
 - A. No
 - B. Yes, but no written document
 - C. Yes, and it is well documented.
11. Have you ever attended a seminar or training related to food defense?
 - A. No
 - B. Yes (If yes, Please briefly describe about the seminar/training you attended in the blank below) _____
12. What is the title of your position? _____
13. How long have you held this position? _____ years
14. How many years have you been employed in foodservice? _____ years
15. Are you a Registered Dietitian (RD)?
 - A. No
 - B. Yes
16. In your position, can you influence changes in policy and protocols/practice?
 - A. No
 - B. Yes
17. What is your age? _____
18. What is your gender?
 - A. Female
 - B. Male

19. What is your highest level of education completed?

- A. Less than high school
- B. High school
- C. Vocational institution
- D. Some college (e.g. Junior college, community college, etc.)
- E. Bachelor's degree
- F. Some graduate school
- G. Graduate degree (i.e. Master's or Doctoral)

Please check (✓) one of the organizations below to which you would like us to make our \$2 donation upon your participation in this study.

- ☐ School Nutrition Association
- ☐ American Society for Healthcare Foodservice Administrators
- ☐ Healthcare Foodservice Management
- ☐ March of Dimes
- ☐ The National Breast Cancer Foundation

- Thank you for your participation. Please mail questionnaire in the postage-paid envelop. -

**Appendix B - Information about Food Defense Management Plan
(Short form)**

Section A: Information about Food Defense Management Plan

INSTRUCTIONS: Please carefully read the four paragraphs below that describe a food defense management plan, and then answer the question at the bottom of this page before proceeding to questions in the next sections of the survey booklet.

A food defense management plan is a written document that describes the policies and procedures that minimize the risk of intentional contamination of food and reduce the risk of illness or death in your facility. The purpose of a food defense management plan is “to limit the opportunity for someone to ***intentionally*** contaminate food for the purpose of causing harm or death” (USDA, 2003). Although it is hard to imagine that someone would intentionally contaminate food products, endanger the safety of your customers and employees, and harm the reputation of your facility, there are many cases of tampering in the United States and around the world. These malicious attackers can be categorized as criminals, protestors, terrorists, subversives and disgruntled insiders (American Institute of Baking [AIB] International, 2006).

In this study, the terms, ‘*food terrorism*’ and ‘*food terrorist attack*’, include all types of intentional contamination of food regardless of the type of attacker. Food terrorists may use chemical, biological, radiological, or physical agents to contaminate foods. There are several different ways to prevent food terrorism including video surveillance, controlled access, secured doors, lighting, hotline, communication, and employee training, etc. A food defense management plan is designed to identify possible attackers and agents and to develop and implement practical security measures.

Resources that will help you to understand a food defense management program and to develop and implement it to your operation are easily obtainable from governmental agencies websites such as USDA (<http://schoolmeals.nal.usda.gov/Safety/biosecurity.pdf>), and FDA (<http://www.cfsan.fda.gov/~dms/secgui11.html>). Also, some of the higher education institutions (e.g. Kansas State University) and private organizations (e.g. AIB international) are now providing courses or workshops related to food defense management.

Based on the information above, is this following statement true or false? Please indicate your answer by circling A or B.

1. "Food defense management plan is a written document that describes the policies and procedures that minimize the risk of intentional contamination of food and reduce the risk of illness or death in your facility".

A. True

B. False

**Appendix C - Information about Food Defense Management Plan
(Long form)**

Section A: Information about Food Defense Management Plan

INSTRUCTIONS: Please carefully read the four paragraphs below that describe a food defense management plan, and then answer the three questions on the next page before proceeding to section B of the survey booklet.

A food defense management plan is a written document that describes policies and procedures that minimize the risk of intentional contamination of food and reduce the risk of illness or death in your facility. The purpose of a food defense management plan is “to limit the opportunity for someone to ***intentionally*** contaminate food for the purpose of causing harm or death” (USDA, 2004). Although it is hard to imagine that someone would intentionally contaminate food products, damage the reputation of your facility, and harm your employees and customers, there are many cases of tampering in the United States and around the world. These malicious attackers can be categorized as criminals, protestors, terrorists, subversives and disgruntled insiders (American Institute of Baking [AIB], 2006).

In this study, the terms ‘*food terrorism*’ and ‘*food terrorist attack*’ include all types of intentional contamination of food regardless of the type of attacker. Food terrorists may use chemical, biological, radiological, or physical agents to contaminate foods. There are several different ways to prevent food terrorism including video surveillance, controlled access, secured doors, lighting, hotline, communication, and employee training, etc. The goals of a food defense management plan are to identify possible attackers and agents and to develop and implement practical security measures. A food defense management plan will lead foodservice operators to (1) establish a food defense management team; (2) audit their facility to identify hazards; (3) assess the risks to prioritize critical areas that need immediate preventive measures; (4) analyze risk control measures for the identified potential hazards; (5) implement preventive practices; and (6) maintain the program continuously.

In order to develop an effective food defense management plan, you must first establish a food defense management team with internal (such as foodservice director/manager, employee, building guard, administrator, etc) and external (local health department representative, environmental health specialist, sanitarian, etc.) members and choose a team leader. The team then completes an assessment of the facility using a checklist. The checklist can be obtained from government agencies (e.g. USDA, or FDA) or special training/awareness program providers (e.g. AIB). In addition to the pre-established checklist, the unique characteristics of your facility should be included in the checklist. After the inspection, the team determines preventive measures that could be part of the plan. The team then prioritizes the preventive measures, assigns tasks, and develops a schedule of target dates for each task. Throughout the implementation phase, the team should track the progress. This is not the end of the plan. The policies and procedures in the food defense management plan should be continuously reviewed and updated. As circumstances change and as new information becomes available, the plan should be revised to be continuously effective.

Resources that will help you understand a food defense management program and to develop and implement one in your operation are easily obtainable from governmental agencies websites such as USDA (<http://schoolmeals.nal.usda.gov/Safety/biosecurity.pdf>), and FDA (<http://www.cfsan.fda.gov/~dms/secgui11.html>). Also, many higher education institutions (e.g. Kansas

State University) and private organizations (e.g. AIB) are now providing courses or workshops related to food defense management.

Please indicate whether the following three statements are true or false based on the information you read on the previous page by circling the letter "A" or "B".

1. "A food defense management plan is a written document that describes policies and procedures that minimize the risk of intentional contamination of food and reduce the risk of illness or death in your facility."

A. True

B. False

2. "The goals of a food defense management plan are to identify possible attackers and agents and to develop and implement practical security measures."

A. True

B. False

3. "Only internal members of the facility such as foodservice manager, employee, building guard, administrator, etc. are included in the food defense management team."

A. True

B. False

Appendix D - Expert Evaluation Form

Instrument Critique Form

Please evaluate the questionnaire which can be found from page 5 to 15. All parts questionnaire are complete except for section D. I need your help to finalize this section of the instrument. Imagine you are the actual participant of the study and try to answer to the questions following the instructions given in each section of the questionnaire. After you finish answering the actual questions in the survey booklet, please complete this critique form. Feel free to provide any concerns or opinions. In the comment section under each item, please provide suggestion to enhance the questionnaire. If you need more space, use the back side. Return the completed questionnaire and critique form to me by December 14th.

Part A: Overall Evaluation of the Questionnaire

Using a 5-point scale below (1: strongly disagree ~ 5: strongly agree), please indicate the extent to which you agree with the following statements. Please provide specific comments for items.

Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree
1	2	3	4	5

1. The instrument can measure the intended constructs.

Strongly Disagree					Strongly Agree
1	2	3	4	5	

Comments:

2. The format of the questionnaire facilitates ease of reading.

1	2	3	4	5
---	---	---	---	---

Comments:

	Strongly Disagree				Strongly Agree
3. The instructions are easy to understand.	1	2	3	4	5
Comments:					

4. The respondents will be able to answer to the questions without difficulties.	1	2	3	4	5
Comments:					

5. The length of the survey is too long.	1	2	3	4	5
Comments:					

6. The participants (on-site foodservice operators) will find the study interesting.	1	2	3	4	5
Comments:					

Part B: Evaluation of each section

Using a 5-point scale below (1: strongly disagree ~ 5: strongly agree), please indicate the extent to which you agree with the following statements. In the comment section, please provide suggestions that would improve each section.

Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree
1	2	3	4	5

Section A: Information about Food Defense Management Plan

	Strongly Disagree				Strongly Agree
	1	2	3	4	5
1. The explanation about the food defense management plan is informative.					
Comments:					
2. The explanation about the food defense management plan is easy to read.					
Comments:					
3. The explanation about the food defense management plan is to understand.					
Comments:					
4. The questions asked at the end of this section can check whether the respondents read the information about the food defense management plan.					
Comments:					
5. The questions asked at the end of the section should be revised (grammar, choice of word, etc.).					
Comments:					

Section B: Perceptions about Food Terrorism and Food Defense Management Plan

Strongly Disagree			Strongly Agree	
1	2	3	4	5

1. The instructions are clear and concise.

Comments:

2. Items cover all aspects of *Perceived Severity*, *Perceived Vulnerability*, *Response Efficacy*, *Response Cost*, and *Self/Operational Efficacy*.

1	2	3	4	5
---	---	---	---	---

Comments:

3. Some of the items should be revised or removed. (Please list the question number and provide suggestions that would enhance them.)

1	2	3	4	5
---	---	---	---	---

Comments:

Section C: Motivation and Intention to implement a food defense plan and to avoid food terrorism

	Strongly Disagree				Strongly Agree
	1	2	3	4	5
1. The instructions are clear and concise.					

Comments:

2. Items cover all aspects of <i>motivation</i> and <i>implementation intention</i> y.	1	2	3	4	5
--	---	---	---	---	---

Comments:

3. Some of the items should be revised or removed. (Please list the question number and provide suggestions that would enhance them.)	1	2	3	4	5
---	---	---	---	---	---

Comments:

Section E: Demographic Information

	Strongly Disagree				Strongly Agree
	1	2	3	4	5
1. The instructions are clear and concise.					
Comments:					
2. There are some items that should be added.					
Comments:					
3. Some of the items should be revised or removed. (Please list the question number and provide suggestions that would enhance them.)					
Comments:					

Section D: Your Current Food Defense Practices

Please select the 10 most important practices for food defense against any possible food terrorism attack in foodservice operations. Record your responses directly in section D of the questionnaire. If you have any suggestions about the wording of any of the ten items, please include those below.

Appendix E - Brief Introduction to PMT for the Reviewers

Food Defense Management Plan Implementation Intention: An Application of Protection Motivation Theory (PMT)

Food defense is one of the emerging issues that should be addressed immediately. Under the Bioterrorism Act of 2002, the Food and Drug Administration regulates various entities in the food supply chain. However, the government does not monitor defensive practices in foodservice operations, which are one of the last control points for a safe food supply. The government has developed guidelines to assist foodservice operations in securing their operations and ensuring the safety of their employees and customers. However, these guidelines are just recommendations. Therefore, the foodservice operations' willingness to follow these guidelines will determine how well a foodservice operation is prepared to respond to any possible food terrorism attack. This research investigates foodservice operators' intention to follow the guidelines. In order to examine operators' intentions more precisely, their perceptions about food terrorism and a food defense management plan will be measured using the protection motivation theory (PMT).

Brief Introduction to the PMT

Protection motivation theory (PMT) will be used to measure foodservice operators' intentions to implement a food defense management plan in this study. The protection motivation theory (PMT) is a fear appeal model to predict and persuade an individual's behavior. According to PMT, when an individual faces a threat, two cognitive appraisal phases – threat appraisal and coping appraisal – mediate the choice of a coping behavior. In order to persuade individuals to perform preventive behaviors, both appraisal phases should be high enough to form protection motivation (Rogers, 1983).

PMT Relevance to this study

In the protection motivation theory, perceptions related to risk (i.e. threat appraisal: severity & vulnerability perception) and perceptions related to the effectiveness of preventive measures (i.e. coping appraisal: response efficacy, self-efficacy, response cost) together form a protection motivation. Therefore, investigation into foodservice operators' risk perceptions of food terrorism (severity & vulnerability) and their perceptions about the effectiveness of a defensive management plan (response efficacy, self-efficacy, response cost) will provide more precise

information about how likely the foodservice directors are to implement a food defense (biosecurity) management plan in their operations.

Definitions for PMT

- Threat Appraisal:** Threat appraisal consists of severity perception and vulnerability perception. Threat appraisal is related to perceptions of performing maladaptive behaviors.
- Coping Appraisal:** Coping appraisal is related to perceptions of performing adaptive behaviors. Coping appraisal involves an individual's assessment of the effectiveness of the recommended behavior and the individual's perceived ability to implement the recommended behavior.
- Perceived Severity:** Perceived severity is how seriously an individual takes a threat.
- Perceived Vulnerability (Perceived Susceptibility):** Perceived vulnerability is how personally susceptible an individual feels about the communicated threat.
- Self-Efficacy:** Self-efficacy is the perceived ability of a person to initiate the adaptive response.
- Response Efficacy:** Response efficacy is the belief that the adaptive response will be effective in preventing harm.
- Response Cost:** Response cost is any cost associated with implementing the adaptive coping response.

Instrument Development

Based on previous PMT literatures and food terrorism/defense related resources, a draft questionnaire has been developed. Since you are an expert in this area or in a unique position related to your experience in food terrorism, food defense, or disaster communication, your assistance in critiquing the questionnaire is being sought. You are requested to review each section and provide me suggestions to enhance the effectiveness of the questionnaire.

Below are brief explanations of the objectives of the sections of the questionnaire. Please review the content of each section of the instrument and assess whether the items can measure the desired constructs. Please use enclosed evaluation form for your review. If you have comments to make besides the evaluation questions listed on the form, please use the space provided at the end of the evaluation form for you to describe how the items could be improved.

Section A: The survey questionnaire will begin with explanation of a food defense management plan in section A. After the explanation, respondents will be asked to answer simple true/false questions. The purpose of these questions is to discern respondents who read the explanation

paragraphs (or, at least who have some idea about a food defense management plan) from those who did not read them and is unfamiliar with the concept.

Section B: In this section, respondents' perceptions about food terrorism, food defense, and their ability implement it are measured using 7-point Likert type scale. Each construct will be measured on 4-8 items.

Section C: In this section, motivation and behavioral intention will be measured. Motivation (approach/avoidance) will be measured by 13 manifesting items using a 7-point Likert type scale. Before respondents are asked to respond to the final endogenous variable (behavioral intention), those who already implemented or developing and/or implementing a food defense management plan will be screened by dichotomous items. Only those who had not developed or implemented the management plan will be directed to the items measuring behavioral intention (a.k.a. implementation intention).

Section D: The foodservice operations current practices related to food defense will be assessed. I need your assistance in reducing the items from 35 to 8 or 10 items, thus the attached questionnaire does not include section D, yet. I want you to choose the 10 most IMPORTANT practices for food defense against any possible food terrorism attack in foodservice operations. The final 8 ~ 10 selected items will also be measured in 7-point Likert type scale (1-strongly disagree ~ 7-strongly agree).

Section E: In the last section of the questionnaire, respondents' demographic information (age, gender, education, occupation, years in the occupation, food defense training experience, etc.) and operational information (size proxies such as annual budget and number of employees (FTE), type of operation (healthcare vs. school, independent vs. contract and central vs. satellite), location, existence of crisis management plan, etc.) will be obtained.

Appendix F - Sample Size and Number of Responses from Each State

STATE	Hospital		School		STATE	Hospital		School	
	# of Sample	# of Res.	# of Sample	# of Res.		# of Sample	# of Res.	# of Sample	# of Res.
AK	4	0	4	2	NC	25	5	54	12
AL	14	6	23	10	ND	7	1	1	0
AR	12	1	9	2	NE	14	5	4	2
AZ	20	0	23	5	NH	8	3	2	0
CA	61	9	187	28	NJ	31	5	32	5
CO	13	2	22	8	NM	4	0	12	5
CT	12	2	16	2	NV	9	0	5	1
DE	4	0	4	1	NY	108	21	35	9
FL	32	4	45	15	OH	68	8	30	9
GA	31	0	38	13	OK	23	4	8	1
HI	4	1	1	0	OR	13	4	16	1
IA	16	3	8	4	PA	82	10	23	5
ID	5	1	6	1	RI	4	0	3	0
IL	47	10	28	5	SC	8	0	30	3
IN	31	4	26	9	SD	9	2	2	0
KS	16	4	6	2	TN	16	3	19	3
KY	17	3	15	2	TX	55	18	107	33
LA	25	5	24	6	UT	7	3	12	2
MA	19	3	16	1	VA	20	2	37	6
MD	16	3	17	3	VT	4	2	0	0
ME	12	3	0	0	WA	27	4	38	7
MI	33	7	32	6	WI	32	8	10	3
MN	14	2	22	7	WV	7	0	11	1
MO	37	12	22	6	WY	5	0	3	2
MS	9	1	7	3	AP	2	0	0	0
MT	5	1	4	0	DC	3	0	1	0

Appendix G - Compositions of Six Regions

Eastern	Western	Southern	Northern	Central	Midwest
AL	AK	AR	IA	CO	IL
CT	AZ	KY	MN	KS	IN
DE	CA	LA	MT	MO	MI
FL	HI	MS	ND	NE	OH
GA	ID	NM	SD		
ME	NV	OK	WI		
MD	OR	TN	WY		
MA	UT	TX			
NH	WA				
NJ					
NY					
NC					
PA					
RI					
SC					
VT					
VA					
WV					

Appendix H - Number of Samples and Responses from Different Regions

Regions	Hospital			School		
	Sample	Response	Response Rate	Sample	Response	Response Rate
Eastern	437	69	15.79%	386	86	22.28%
Western	150	22	14.67%	292	47	16.10%
Southern	161	35	21.74%	201	55	27.36%
Midwest	179	29	16.20%	116	29	25%
Northern	88	17	19.32%	50	16	32%
Central	80	23	28.75%	54	18	33.33%
Etc. ^a	5	0	0	1	0	0
Unknown	3	NA
TOTAL ^b	1100	195	17.73%	1100	254	23.10%

^a. DC and AP

^b. Total Response rates are calculated based on the total number of questionnaire mailed out on the first mailing. Returned as 'undeliverable' were not counted in this calculation.

Appendix I - Regional Comparisons

	Total (N =446) ^a	Eastern (N = 155) ^a	Western (N =69) ^a	Southern (N =90) ^a	Central (N =41) ^a	Midwest (N =58) ^a	Northern (N = 33) ^a		
	Count (Expected)	Count (Expected)	Count (Expected)	Count (Expected)	Count (Expected)	Count (Expected)	Count (Expected)	χ^2	Sig.
Seminar/Training									
Yes	104	49 (36.5)	11 (16.1)	19 (20.8)	11 (9.7)	6 (13.5)	8 (7.3)	13.730	0.017
No	335	105 (117.5)	57 (51.9)	69 (67.2)	30 (31.3)	51 (43.5)	23 (23.7)		
Education									
High school	5	2 (1.7)	1 (0.8)	1 (1)	0 (0.5)	1 (0.6)	0 (0.4)	38.606	0.040
Vocational school	4	3 (1.4)	0 (0.6)	0 (0.8)	0 (0.4)	0 (0.5)	1 (0.3)		
Some college	41	14 (14.2)	10 (6.4)	2 (8.3)	7 (3.8)	5 (5.2)	3 (3.1)		
Bachelor's degree	120	41 (41.5)	23 (18.7)	18 (24.4)	8 (11.1)	15 (15.2)	15 (9)		
Some graduate	74	20 (25.6)	12 (11.6)	22 (15.1)	3 (6.9)	12 (9.4)	5 (5.5)		
Graduate	198	73 (68.5)	23 (30.9)	47 (40.3)	23 (18.4)	23 (25.1)	9 (14.8)		
RD									
Yes	192	53 (66.7)	28 (29.9)	51 (38.6)	23 (17.8)	20 (24.7)	17 (14.3)	17.472	0.004
No	251	101 (87.3)	41 (39.1)	38 (50.4)	18 (23.2)	37 (32.3)	16 (18.7)		

^a. Valid responses only are included, thus the variability in number of responses