Evaluation of the Performance of TN Integrated Food Safety Center of Excellence Online Training Courses

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Amal S. Humidat
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ABSTRACT

Foodborne disease outbreaks are still a challenge in the United States even with the improvements that are continuously made to the food integrity system. The Center for Agriculture and Food Security and Preparedness (CAFSP), in conjunction with the Tennessee Integrated Food Safety Center of Excellence, has developed two web-based courses to support investigation of foodborne illnesses. These courses are entitled as “Foodborne Outbreak Investigation and Response Team Roles and Responsibilities, Part A and B” respectively. The overall goal of this study was to evaluate each course by assessing the participants' satisfaction, learning, and perception of knowledge gained and impact on job performance.

Participants’ knowledge of foodborne disease outbreak investigation was assessed through a quiz before and after each of the courses. While their satisfaction and perception of knowledge gained and impact on performance were assessed using 5-point Likert-scale questions.

For course A, most participants (89%-99%) were satisfied with the course content, design, and delivery. There was a statistically significant ($P < 0.001$) difference between pre- (mean=77) and post-test (mean=91) results of participants (n=188). About 85% of participants (18.8%) perceived that course A improved their overall job performance. Similarly, the majority of participants (83%-91%) rated course B positively. The pre- (mean=62) and post-test (mean=82) results of participants (n=87) were statistically significantly ($P < 0.001$) different. More than 88% of participants (23.5%) indicated that course B improved their knowledge and performance on job.

Overall, both online courses assessed in this study improved participants' knowledge about foodborne outbreak investigation and their performance on the job. Future efforts should support the improvement of the current online training courses as well the development of new courses to target both consumers and all public health professionals associated with the food supply and delivery. These efforts could reduce the current foodborne illnesses in the United States.

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CHAPTER 1: INTRODUCTION

Statement of Problem

Foodborne disease outbreaks are still a challenge in the United States even with the improvements that are continuously made to the food integrity system (Nyachuba, 2010; Scharff, 2015). According to the Centers for Disease Control and Prevention (CDC, 2011), there are approximately 48 million new cases of foodborne illness each year in the United States, causing 128,000 hospitalizations and 3,000 deaths. The investigation of foodborne disease outbreaks is not the task or responsibility of one person; instead, it requires establishing a team in advance, providing training, and having good communication and collaboration among all agencies. Studies have shown that online courses have been effective and can be an alternative to field training for building a skilled capacity for outbreak investigation and improving food safety knowledge (Stehr-Green & Gathany, 2005; Shaw, Dzubak, Strohbehn, & Naeve, 2016). Therefore, evaluation of these training courses is required to determine to what extent the training was effective in improving participants' attitudes, knowledge, skills, and behaviors.

Context of the Study

The Center for Agriculture and Food Security and Preparedness (CAFSP), in conjunction with the Tennessee Integrated Food Safety Center of Excellence, has developed two web-based courses. The courses are entitled as "Foodborne Outbreak Investigation and Response Team Roles and Responsibilities, Part A and B" respectively. Course A was launched in October 2014 and Course B in September 2015. These courses address the investigation of foodborne illnesses and focus on providing training to epidemiologists, laboratory personnel, environmental health specialists, and any others who would be involved in a foodborne outbreak investigation and

response. Part A is comprised of three modules, which cover the roles and responsibilities of the outbreak investigation team and the importance of communication between team members to enhance the effectiveness of the response, and thus reduce the incidence of foodborne illness. Part B includes four modules that address the surveillance systems used for foodborne outbreak response and the changes of team dynamics in response to different types of foodborne outbreak (CAFSP, n.d.).

Purpose and Objectives of the Study

The overall goal of the project was to evaluate the performance of these training courses through:

1. Assessing the satisfaction level of participants by reviewing and analyzing the data from course evaluation questionnaires.
2. Assessing the learning achieved by participants by comparing the pre- and post-test results.
3. Designing and administering a survey for each course to assess the participants' perception of knowledge gained and impact on their performance.

Importance of the Study

The findings of this study can be used to improve the online courses offered by CAFSP. They may also assist educators, evaluators, and decision-makers in designing effective online training.

CHAPTER 2: LITERATURE REVIEW

Foodborne Disease Outbreaks

Foodborne diseases resulting from the ingestion of foods contaminated with pathogens or chemicals are still a public health challenge worldwide. Based on the World Health Organization (WHO) Fact sheet (2017), diarrheal illnesses are annually responsible for approximately 1.7 billion cases among children, resulting in 525,000 deaths in children under the age of five, which makes them the second greatest cause of mortality in this age group. Although most deaths occur in developing countries, foodborne disease outbreaks are still a public health concern in the United States even with the continuous developments in the food integrity system (Nyachuba, 2010; Scharff, 2015). According to the Centers for Disease Control and Prevention (CDC, 2011), there are nearly 48 million new cases of foodborne illness each year in the United States, leading to 128,000 hospitalizations and 3,000 deaths.

There are some factors that have increased the global challenge of foodborne diseases including travel, migration, food processing, international trade, and globalization of the food supply (Council to Improve Foodborne Outbreak Response (CIFOR), 2014; Nyachuba, 2010; Tauxe, Doyle, Kuchenmüller, Schlundt, & Stein, 2010). As the population's demands and food preferences are changing rapidly, the food industry increasingly is relying on importation from other countries. Furthermore, changes in agricultural practices, food processing, packaging, and distribution have contributed to problematic trends in foodborne diseases, such as emerging and antibiotic resistant pathogens, and have made food safety problems even more complicated as food can be contaminated at any point during the Farm-to-Fork chain. The distribution of contaminated food products results in foodborne disease outbreaks affecting millions of people

and the health and economy of numerous countries (CIFOR, 2014; Nyachuba, 2010; Tauxe et al., 2010).

Foodborne disease outbreaks occur when two or more cases of a similar foodborne disease result from the ingestion of a common food (WHO, 2008) or when "the observed number of cases of a particular disease exceeds the expected number" (WHO, 2008, p. 9) during the same time. The investigation of foodborne disease outbreaks is a multi-disciplinary process that requires establishing a qualified team in advance, providing training, and having good communication and collaboration among all agencies to achieve successful investigation and control (CIFOR, 2014; WHO, 2008). The primary goals of outbreak investigations are to find the source of infection and stop the spread of disease by removing the risk factors. However, there are no standardized steps that can be taken each time to investigate foodborne disease outbreaks (CIFOR, 2014; WHO, 2008).

Murphree et al. (2012) stated that the rates of foodborne disease outbreaks and the characteristics of investigations are significantly variable between states. He clarified that this variability might be due to the differences in their resources and interventions, which include public health personnel and active surveillance systems, and the reporting regulations followed in each state. Additionally, the presence of other emergencies in each state may affect its commitment to investigations.

Consequences of Foodborne Disease

Public Health Concerns

There are several factors that affect the estimates of the burden of foodborne diseases, including under-diagnosis, underreporting, different definitions for each disease, and incomplete

investigations (Nyachuba, 2010; Scallan et al., 2011b). Scallan et al. (2011b) reported that there are 9.4 million foodborne illnesses, 55,961 hospitalizations, and 1,351 deaths caused by 31 major pathogens each year in the United States. They detailed that 59% of foodborne illnesses were caused by viruses, 39% by bacteria, and 2% by parasites. Norovirus was the leading cause of illnesses, followed by non-typhoidal *Salmonella spp.*, *C. perfringens*, and *Campylobacter spp*. Non-typhoidal *Salmonella spp*. -were the leading cause of hospitalizations, followed by norovirus, *Campylobacter spp.*, and *Toxoplasma gondii*. The leading causes of death were non-typhoidal *Salmonella spp.*, *T. gondii*, *Listeria monocytogenes*, and norovirus. On the other hand, Scallan, Griffin, Angulo, Tauxe, & Hoekstra (2011a) estimated the domestically acquired foodborne illnesses caused by unspecified agents by assuming the distribution of known gastroenteritis pathogens and unknown foodborne agents were similar, which resulted in an estimate of 38.4 million illnesses, 71,878 hospitalizations, and 1,686 deaths each year. Accordingly, the total estimate of foodborne disease effect was determined by combining the estimates from known pathogens and unspecified agents, yielding 47.8 million illnesses, 127,839 hospitalizations, and 3,037 deaths.

The estimates of foodborne illness can be used to prioritize resources, direct public health policies and regulations, and evaluate the economic effect of the illness (Scallan et al., 2011b). Due to the high incidence of foodborne diseases, public health agencies and academic and professional institutions have started providing training programs to improve knowledge of food safety (Viator, Blitstein, Brophy, & Fraser, 2015).

Economic Impact

Foodborne disease outbreaks create high economic costs, reduced quality of life, and loss of productivity (Nyachuba, 2010). Foodborne illness annually costs the United States from $10 to 83 billion (Nyachuba, 2010). The estimated cost of about $1,068 for an average case of foodborne illness has been used to estimate the national economic impact of foodborne illness (Scharff, 2015). However, the economic estimates are likely to significantly vary across states due to numerous factors, such as the variation in income and the differences in the incidence of illness, costs of medical care, and other consequences (Scharff, 2015). Therefore, Scharff (2015) reported the costs of foodborne illness at the state level using two models. For example, the average cost per case using a basic conservative model ranged from $888 in West Virginia to $1,766 in the District of Columbia, resulting in a total of approximately $55.5 billion nationally. While using a less conservative model resulted in average costs per case of $1,505 in Kentucky to $2,591 in Maryland for a total of $93.2 billion nationally.

The cost-of-illness estimates are used for evaluation and implementation purposes at both the national and state levels. As a result, it is important to consider the variation in the costs of foodborne illness between states when evaluating the effectiveness of interventions at the state level (Scharff, 2015).

Public Health Workforce

The public health workforce has been facing many challenges including economic restrictions, rising demands and expectations, and emerging health problems (Hunter, 2015). Today, other challenges are threatening governmental public health agencies. According to the Public Health Workforce Interests and Needs Survey (PH WINS) completed by the Association

of State and Territorial Health Officials (ASTHO), 18% of public health workers were planning to leave their jobs within one year, while 38% of workers intended to leave by 2020 for reasons of retirement or transition to jobs outside of public health. The survey revealed that the individuals planning to transition to other sectors were not satisfied with their pay. These individuals were 25-40 years old with less than 10 years of experience and included racial and ethnic minorities (ASTHO, 2015). In addition, the ratio of the public health workforce to the US population has reduced by 28% between 1980 and 2000 (Castrucci, 2015). The workforce shrinkage and the loss of young workers result in deficiencies of experience, leadership, and skills required for continuing professional development (Hunter, 2015).

The organization of public health systems are variable between states. State health agencies are classified based on the relationship between the state and local public health departments. According to ASTHO (2012), there are 14 states that are considered centralized/largely centralized, in which the Local Health departments (LHDs) have state governance, 27 decentralized/largely decentralized under the authority of local governments, 4 states governed by both state and local authorities (shared/largely shared governance), and the remaining five states (including TN) have mixed authorities. Based on the data from National Association of County and City Health Officials (NACCHO), there are approximately 2,800 LHDs in the United States, and they vary in their structures and activities across the country. About 85 % of them employ environmental health professionals, whereas epidemiologists and laboratory workers are employed in only 36% and 26%, respectively, of the LHDs. Typically, only LHDs that serve large populations provide occupations for laboratory workers and public information specialists. However, between 2008 and 2013, the estimated total full-time

equivalents (FTEs) of environmental health workers employed by LHDs decreased by 2000 FTEs, while the total employment increased among epidemiologists and public information specialists (NACCHO, 2014).

It is important that public health agencies improve strategies to address these issues and rebuild a skilled workforce that meets the future needs through engaging young professionals, improving diversity, reducing pay gaps by gender and race (ASTHO, 2015), implementing a standardized training needs assessment, and developing new training programs so that they will be able to continue to serve the nation's health (Hunter, 2015).

Online Education

In the last two decades, numerous changes in online and distance education have emerged. These changes include open learning opportunities and the development of online courses. Educational institutions are offering online programs in various disciplines and at different levels, and they recognize that online education is necessary to their long-term plans (Allen, & Seaman, 2011). In 2010, about 31% of all higher education students in the USA were enrolled in at least one online course (Allen, & Seaman, 2011), and enrollment has increased almost 30% since then (Shendell, Apostolico, Milich, Patti, & Kelly 2016). The potential advantages of this trend include flexibility in terms of time management, accessibility and convenience for users, variety of delivery methods, and lower cost. This is especially important for working adults who want to develop their skills and get continuing education along with their careers and other personal responsibilities (Ilgaz, & Gülbahar, 2015; Shendell et al., 2016).

Unlike traditional courses, online courses require additional skills provided by instructional designers and IT specialists. Moreover, adult learners need to have some technical

skills and access to technology to benefit and achieve their expectation from the online learning (Ilgaz, & Gülbahar, 2015).

Implementing and Evaluating Training Programs

To implement an effective training program, the program must meet the participants' needs, which can be assessed through surveying the target population. The needs are converted into learning objectives that participants are expected to master. These objectives may include expected behavior change on the job. In addition, the training should be offered at the participants' convenience to assure that their attitudes toward the program is positive. Finally, the training should be evaluated. However, decisions regarding what levels to evaluate and the procedure to use should be made and developed in advance (D. Kirkpatrick & J. Kirkpatrick, 2007)

Evaluation of training programs is important as education is a dynamic process that requires continuous improvement, so it is done for the purposes of obtaining information on the quality of the training offered, issues to solve, or suggestions for modification and improvement. Therefore, a well-designed evaluation is based on asking specific questions that lead to valid answers and provide reliable data for decision making (Guskey, 2000).

Kirkpatrick's Model for Evaluation

Kirkpatrick's Four-Level Training Evaluation Model includes the assessment of learner's satisfaction, learning, behavior, and the outcomes of the training. These four levels should be done in the presented sequence and no level should be skipped to get to the next (D. Kirkpatrick & J. Kirkpatrick, 2006)

Based on Kirkpatrick's model, satisfaction of online learners is an important factor for educators, instructional designers, and other stakeholders as it determines how successful the course is in terms of content, design, delivery, and other aspects that affect the quality of the learning environment. Participants' satisfaction is measured through reaction sheets that provide immediate feedback. This feedback is important to assess how the trainees feel about the program as positive reaction would motivate them to learn. It is also important to let them feel that their feedback is appreciated and necessary for continuous improvement. However, positive reactions and satisfaction do not necessarily mean that they learned anything. It would reflect only that they have enjoyed the experience. Therefore, measuring learning is the next step in the model to assess whether the participants have increased knowledge, learned/ improved skills, or improved/changed attitudes. Evaluating learning is important as learning must occur before behavior change takes place. Learning can be evaluated using a pre- and post-test comparison method. This method is suitable in case the participants have previous knowledge of the subject. Furthermore, multiple-choice tests are more valid than True/false or Agree/Disagree questions. For skill-based courses, testing knowledge is not enough and performance tests are required to test learning (D. Kirkpatrick & J. Kirkpatrick, 2006).

Evaluating at level 3 in Kirkpatrick's model aims at measuring the changes in behavior as a result of the training. In other words, it is an attempt to see whether the acquired knowledge, skills, or attitudes evaluated at level 2 have transferred to the job. To encourage this transfer, it is recommended that supervisors provide support and reinforcement to participants when they return to the work after training. Evaluating behavior is more complicated and time-consuming than evaluating reactions and learning. While evaluating reactions and learning should be done

immediately after training, evaluating behavior requires waiting until a change occurs. However, there is no way to tell when the change would take place. Moreover, evaluating behavior is challenging as it requires decisions to be made on when and how to evaluate behavior and whether repeated evaluations are needed or not. These difficulties prevent most trainers and organizations from evaluating at this level. In addition, assessing at this level can be very costly. However, Kirkpatrick encourages doing some evaluation at level 3 even if it is not scientific based. Evaluating at level 3 is important as behavior change indicates that final desired results can be accomplished (D. Kirkpatrick & J. Kirkpatrick, 2006).

The fourth and last level in Kirkpatrick's model is to determine whether the final results, such as improved quality, reduced costs, or increased productivity, were achieved because of the training. Several factors are taken into account when determining the time and expense to spend on evaluating at this level. These factors include the cost of the training, the frequency of offering it, and the value of potential results. After comparing the final outcomes with the cost of the training, decisions on continuation of the training can be made (D. Kirkpatrick & J. Kirkpatrick, 2006).

CHAPTER 3: EVALUATION OF THE PERFORMANCE OF TN INTEGRATED FOOD SAFETY CENTER OF EXCELLENCE ONLINE TRAINING COURSES

Abstract

Foodborne disease outbreaks are still a challenge in the United States even with the improvements that are continuously made to the food integrity system. The Center for Agriculture and Food Security and Preparedness (CAFSP), in conjunction with the Tennessee Integrated Food Safety Center of Excellence, has developed two web-based courses to address issues related to foodborne illnesses. These courses are entitled as "Foodborne Outbreak Investigation and Response Team Roles and Responsibilities, Part A and B" respectively. The overall goal of this study was to evaluate each course by assessing the participants' satisfaction, learning, and perception of knowledge gained and impact on job performance.

Participants' knowledge of foodborne disease outbreak investigation was assessed through a quiz before and after each of the courses. While their satisfaction and perception of knowledge gained and impact on performance were assessed using 5-point Likert-scale questions.

For course A, most participants (n=178) were satisfied with the course content, design, and delivery. There was a statistically significant ($P < 0.001$) difference in pre- (mean=91) and post-test (mean=77) results of participants (n=188). About 85% of participants (18.8%) perceived that course A improved their overall job performance. Similarly, course B reaction form was rated positively by the majority of participants (n=76). The pre- (mean=62) and post-test (mean=82) results of participants (n=87) were statistically significantly ($P < 0.001$) different.

More than 88% of participants (23.5%) indicated that course B improved their knowledge and performance on job.

Overall, both online courses assessed in this study improved participants' knowledge about foodborne outbreak investigation and their performance on the job. Future efforts should support the improvement of the current online training courses as well the development of new courses to target both consumers and all public health professionals associated with the food supply and delivery. These efforts could reduce the current foodborne illnesses in the United States.

Introduction

Foodborne disease outbreaks are still a challenge in the United States even with the continuous improvements to the food integrity system (Scharff, 2015). According to the Centers for Disease Control and Prevention (CDC, 2011), there are approximately 48 million new cases of foodborne illness each year in the United States, resulting in 128,000 hospitalizations and 3,000 deaths.

The investigation of foodborne disease outbreaks is a multi-disciplinary process that requires establishing a qualified team in advance, providing training, and having good communication and collaboration among all agencies to achieve successful investigation and control of foodborne disease outbreaks (CIFOR, 2014; WHO, 2008). The primary goals of outbreak investigations are to find the source of infection and stop the spread of disease by removing the risk factors. However, there are no standardized steps that can be taken each time to investigate foodborne disease outbreaks (CIFOR, 2014; WHO, 2008).

Murphree et al. (2012) stated that the rates of foodborne disease outbreaks and the characteristics of investigations are significantly variable between states. He clarified that this variability might be due to the differences in their resources and interventions, which include public health personnel and active surveillance systems, and the reporting regulations followed in each state. Additionally, the presence of other emergencies in each state may affect its commitment to investigations.

Studies have shown that online courses have been effective and can be an alternative to field training for building a skilled capacity for outbreak investigation and improving food safety knowledge (Stehr-Green & Gathany, 2005; Shaw, Dzubak, Strohbehn,& Naeve, 2016). Consequently, evaluation of these training courses is required to determine to what extent the training was effective in improving participants' attitudes, knowledge, skills, and behaviors that are necessary to reduce the burden of foodborne disease.

The Center for Agriculture and Food Security and Preparedness (CAFSP), in conjunction with the TN Integrated Food Safety Center of Excellence, has developed two web-based courses. These courses were entitled as "Foodborne Outbreak Investigation and Response Team Roles and Responsibilities, Part A and B" respectively. Course A was launched in October 2014 and Course B in September 2015. They were designed to address issues associated with foodborne illnesses and provide training to epidemiologists, laboratory personnel, environmental health specialists, and any others who would be involved in a foodborne outbreak investigation and response. The overall goal of the project was to evaluate the performance of these courses to get a sense of their impact and effectiveness. The objectives of this study were to assess the satisfaction and learning levels of participants and to design and administer a survey for each

course to assess the participants' perception of knowledge gained and impact on their job performance.

Materials and Methods

Ethical Approval

This study was approved by the Institutional Review Board (IRB) of the University of Tennessee, Knoxville (Appendix C).

Participation

Participants were adults over the age of 18 who had completed the training courses and included epidemiologists, laboratory personnel, environmental health specialists, and any others who would be involved in a foodborne outbreak investigation and response. The participants' contact information is kept in the CAFSP database upon creating an account. An invitation to participate in post-training survey was sent to all potential participants with a URL link to the questionnaires on the Qualtrics website. No incentives were offered.

Existing Data

The courses were developed by the CAFSP staff and subject matter experts. Two online tests per course were administered to participants: A pre-test that is administered prior to instruction in the first module and a post-test that is administered immediately after completion of instruction in the last module. Both tests were identical and made up of multiple-choice questions covering the module key learning objectives. The pretest-posttest design is used to measure participants' knowledge before and after the training. In addition to the pre-and posttests, a course evaluation form is also completed online and provides data on participants'

satisfaction with the course. This information was reviewed to identify needed adjustments to course materials and to improve effectiveness of content delivery.

Instrument Development and Data Collection

A questionnaire for each course was designed to collect data related to key course objectives to assess the perception of knowledge gained and the impact of course completion on the participants' performance. The questionnaires were created and distributed through Qualtrics, which is an online survey software that records responses and keeps anonymity of respondents by not saving the IP addresses. Each questionnaire began with a cover letter and consent form (Appendix A & Appendix B). The participants were required to consent to participate, otherwise, they were released and no data was recorded.

The questionnaire contained closed-ended questions using yes/no and multiple-choice questions to collect demographic data. The five-point Likert-type scale was used to collect data about the perceived degree of learning and learning application using the following ordered-choice response categories: 5=Strongly Agree, 4=Agree, 3=Neutral, 2=Disagree, 1=Strongly Disagree. The post-training surveys were sent in December 2016 to all participants who completed the pre-and post-test for each course by that time. The questionnaire for course B was sent to 35 emails (1 email bounced), 3-12 months following their participation in the training and 8 participants responded. The questionnaire for course A was sent to 115 emails (8 emails bounced), 3 to 24 months following course completion and 20 participants responded. The questionnaires were active for three weeks and three reminders were sent. The data was then downloaded and analyzed.

Data Analysis

The qualitative data were analyzed using descriptive statistics, and the frequencies and percentages were calculated. Quantitative data of pretest-posttest difference was checked for normality using visual methods (histogram, normal Q-Q plot, and boxplot) and Goodness of Fit statistical tests (Kolmogorov-Smirnov and Shapiro-Wilk).

If the difference between pre- and post-test results was normally distributed, the tests data was analyzed for differences using Paired-Samples T Test and the significant differences were evaluated at the 95% confidence level ($p<0.05$) using SPSS 24. However, if this data was not normally distributed, then Wilcoxon Signed-Rank Test was used to evaluate the pre-post-test data difference using SPSS 24.

The associations between the perception of course impact and the exposures of having a previous training, years of experience, elapsed time since course completion, and doing an investigation after taking the course were estimated for course A only using Chi-square. The assumptions of Chi- Square include that each observation is independent of all the others, no expected frequency is less than 1, and no more than 20% of the expected counts are less than 5. However, the sample was too small (n=20) and the latter assumption was not met, so Fisher's Exact Test for 2 by 3 contingency tables was used instead of the Pearson Chi Square (Kuzma & Bohnenblust, 2005). The dependent variable "perception of the overall impact of the course on performance" was re-coded by collapsing the 5 categories into three categories (Agree, Neutral, Disagree). All independent variables were dichotomous for this small pilot study and were created by recoding each of them in the following way: having previous training (no, yes), years

of experience (≤5, >5), elapsed time since course completion (≤1 year, >1 year), and participating in an outbreak investigation after course completion (no, yes).

Results

Course A

1. Evaluating Reaction and Satisfaction

Because evaluation forms are completed immediately after taking the course, they provide the first information about how successful the course was and how satisfied the participants were. By 6/18/2017, 178 participants have completed the evaluation form of course A and the data is shown in table 1. More than 90% of the participants reacted positively to all statements regarding the content, design, meeting the expectations, and the willingness to recommend the course to others. In addition, many participants (89%) indicated that they are fully capable of applying the skills they learned in the course.

2. Evaluating Learning

By 6/18/2017, 188 participants completed the pre-and post-tests. The number of participants is different from the previous level because not all participants who finished the pre and post-test completed the evaluation form. The visual inspection of the difference histogram, normal Q-Q plot, and boxplot showed that the pre- and post-test results were approximately normally distributed. Using a paired T test, the pre- and post-test results of course A were significantly different ($p < 0.001$) (table 2).

Table 1: Responses to the Evaluation Form that was completed immediately after taking Course A through the Center for Agriculture and Food Security and Preparedness website (n= 178)

The Positive Statement	**Strongly Agree** N (%)	**Agree** N (%)	**Neither** N (%)	**Disagree** N (%)	**Strongly Disagree** N (%)	**N/A** N (%)
The course content supported the learning objectives.	79 (44%)	97 (55%)	2 (1%)	0	0	0
The course materials and learning aids effectively conveyed the course content.	76 (43%)	96 (54%)	5 (2%)	1 (1%)	0	0
The course contained useful activities to practice and reinforce the learning objectives.	71 (40%)	96 (54%)	6 (3%)	4 (2%)	1 (1%)	0
The course provided the knowledge and skills I need to accomplish the job for which I am receiving this training.	59 (33%)	108 (61%)	7 (4%)	2 (1%)	2 (1%)	0
Based on the training received, I am fully capable of applying the skills I learned from this course.	44 (25%)	114 (64%)	19 (10%)	0	0	1 (1%)
The course content was appropriate for someone within my professional field.	75 (42%)	97 (54%)	5 (3%)	1 (1%)	0	0
The course content was appropriate for someone with my level of experience.	61 (34%)	102 (57%)	7 (4%)	6 (3%)	1 (1%)	1 (1%)
Overall, the course content met my needs and expectations.	63 (35%)	101 (57%)	11 (6%)	3 (2%)	0	0
Overall, the course increased my knowledge, skills and abilities.	62 (35%)	103 (58%)	7 (4%)	5 (2%)	0	1 (1%)
I would recommend this course to my peers.	69 (39%)	93 (52%)	13 (7%)	1 (1%)	2 (1%)	0

Table 2: Data from Paired-Samples T Test for the difference between pre-and post-test results of Course A and B, respectively

Course	**Mean Pre-test**	**Mean Post-test**	**Mean Difference**	**t**	**df**	***P* value (2-sided)**
Course A	77.2	90.8	13.6	18.6	187	<0.001
Course B	62.5	82.3	19.8	14.2	86	<0.001

On the other hand, the p-value of both statistical tests (Kolmogorov-Smirnov and Shapiro-Wilk) was significant (< 0.001), so the null hypothesis was rejected concluding that the difference was not normally distributed. Using Wilcoxon Signed-Rank Test, the p-value (< 0.001) was statistically significant, so the post-test scores were statistically significantly different from the pre-test scores for course A (Table 3).

Table 3: Data from Wilcoxon Signed-Rank Test for the difference between pre-and post-test results of Course A and B, respectively

Course	**Negative Ranks**	**Positive Ranks**	**Ties**	**Z**	***P* value (2-sided)**
Course A (posttest-pretest)	8	165	15	-11.1	<0.001
Course B (posttest-pretest)	0	82	5	-7.9	<0.001

3. Course A Post-Training Survey

Twenty out of 107 participants who received the questionnaire completed it (18.7%). Table 4 shows the demographic characteristics of the respondents. The majority of them (70%) completed the survey 6 to 18 months after the training. There was a higher representation of environmental health inspectors (26.32 %) than epidemiologists (21.05%), and there were no laboratory personnel. Most participants (36.84%) specified themselves in the “Other” category, which included “Public Health Emergency Management”, “Public Health Associate”, “Environmental Health Program Manager”, “Environmental Health Supervisor”, “Emergency

Coordinator", "Emergency Preparedness", and "Statistical Analyst". The participants' years of experience varied from 0 to 40 years with a median of 8.5.

The majority of participants selected "agree" and "strongly agree" regarding their perception of knowledge gained and improved performance (Table 5 & Table 6). For example, all participants (100%) agreed that the course has improved their understanding of the integrated food safety system and the key terms of foodborne disease outbreak, while less participants (77.8%) indicated that the course has improved their communication with other team members during the investigation. To sum up, about 85% perceived that the course has improved their overall job performance when responding to foodborne disease outbreaks.

Because of the small sample size (n=20), Fisher's Exact Test was used instead of Pearson Chi Square to estimate the association between perception of the course impact on performance and the factors shown in table 7. Table 7 shows 2x3 contingency tables and the exact p values (2-sided). Exact p values of Fisher's Exact Test were not statistically significant, so we failed to reject the null hypotheses and concluded that there is no association between the perceived impact of the course and each of having previous training, years of experience, elapsed time since course completion, and participating in an investigation.

Table 4: Characteristics of the participants of Course A post-training survey (n=20)

Characteristic	Frequency (n)	Percent (%)
Gender		
Male	7	38.89
Female	11	61.11
Job Sector		
State	9	45
Local	11	55
Primary Role at Agency		
Environmental Inspector	5	26.32
Epidemiologist	4	21.05
Laboratorian	0	0
Public Health Nurse	3	15.79
Others	7	36.84
Years of Experience		
< 5	7	35
5 to 10	4	20
> 10	9	45
Supervisory Responsibility at Agency		
Yes	7	36.84
No	12	63.16
Completion of Online Course, months		
0-5	4	20
6-12	8	40
13-18	6	30
19-24	2	10
> 24	0	0
Completion of Previous Training		
Yes	15	75
No	5	25
Post-Course Participation in Investigation		
Yes	10	50
No	10	50

Table 5: Responses to Course A post-training survey aimed at evaluating the participants' perception of knowledge gained and impact on performance

The Positive Statement *Completion of the course helped me better understand/improve*	**Strongly Agree N (%)**	**Agree N (%)**	**Neutral N (%)**	**Disagree N (%)**	**Strongly Disagree N (%)**
integrated food safety system. (n=20)	9 (45.00)	11 (55.00)	0	0	0
how local, state, and federal agencies fit into an integrated food safety system. (n=20)	10 (50.00)	8 (40.00)	1 (5.00)	1 (5.00)	0
key terms describing foodborne disease outbreaks. (n=20)	8 (40.00)	12 (60.00)	0	0	0
goals of a foodborne disease outbreak investigation. (n=20)	8 (40.00)	11 (55.00)	1 (5.00)	0	0
my role during a foodborne disease outbreak investigation. (n=20)	8 (40.00)	8 (40.00)	4 (20.00)	0	0
roles of other team members during investigation. (n=20)	6 (30.00)	11 (55.00)	2 (10.00)	1 (5.00)	0
importance of coordination between team members. (n=20)	7 (35.00)	12 (60.00)	1 (5.00)	0	0
potential barriers to effective investigation and response. (n=20)	7 (35.00)	11 (55.00)	1 (5.00)	1 (5.00)	0
important considerations when dealing with the media. (n=20)	7 (35.00)	11 (55.00)	0	2 (10.00)	0
my communications with team members BEFORE a FDO* occurs. (n=18)	3 (16.67)	12 (66.67)	3 (16.67)	0	0
my communications with other team members DURING investigation. (n=18)	3 (16.67)	11 (61.11)	3 (16.67)	1 (5.56)	0
my communications with other team members AFTER investigation. (n=18)	3 (16.67)	12 (66.67)	3 (16.67)	0	0
overall job performance when responding to FDO. (n=20)	8 (40.00)	9 (45.00)	3 (15.00)	0	0

*FDO: Foodborne Disease Outbreak

Table 6: Responses to Course A post-training survey aimed at evaluating the participants' perception of knowledge gained and impact on performance (collapsed categories of Likert Scale)

The Positive Statement *Completion of the course helped me better understand/improve*	**Agree** **N (%)**	**Neutral** **N (%)**	**Disagree** **N (%)**
integrated food safety system. (n=20)	20 (100.00)	0	0
how local, state, and federal agencies fit into an integrated food safety system. (n=20)	18 (90.00)	1 (5.00)	1 (5.00)
key terms describing foodborne disease outbreaks. (n=20)	20 (100.00)	0	0
goals of a foodborne disease outbreak investigation. (n=20)	19 (95.00)	1 (5.00)	0
my role during a foodborne disease outbreak investigation. (n=20)	16 (80.00)	4 (20.00)	0
roles of other team members during investigation. (n=20)	17 (85.00)	2 (10.00)	1 (5.00)
importance of coordination between team members. (n=20)	19 (95.00)	1 (5.00)	0
potential barriers to effective investigation and response. (n=20)	18 (90.00)	1 (5.00)	1 (5.00)
important considerations when dealing with the media. (n=20)	18 (90.00)	0	2 (10.00)
my communications with team members BEFORE a FDO* occurs. (n=18)	15 (83.33)	3 (16.67)	0
my communications with other team members DURING investigation. (n=18)	14 (77.77)	3 (16.67)	1 (5.56)
my communications with other team members AFTER investigation. (n=18)	15 (83.33)	3 (16.67)	0
overall job performance when responding to FDO. (n=20)	17 (85.00)	3 (15.00)	0

*FDO: Foodborne Disease Outbreak

Table 7: 2 x 3 Contingency tables and the p value of Fisher's Exact Test (2-sided) for the association between perception of course A impact on performance and having previous training, years of experience, elapsed time since course completion, and post-course participating in investigation

Independent Variable	**Perception**			**The *P* value of Fisher's Exact Test (2-sided)**
	Agree N (%)	**Neutral** N (%)	**Disagree** N (%)	
Having Previous Training				1
No	4 (80.0)	1 (20.0)	0	
Yes	13(86.7)	2 (13.3)	0	
Years of Experience				1
≤ 5	7 (87.5)	1 (12.5)	0	
> 5	10 (83.3)	2 (16.7)	0	
Elapsed time since completion				0.242
≤ 1 year	9 (75.0)	3 (25.0)	0	
> 1 year	8 (100.0)	0	0	
Post-course participating in investigation				1
No	9 (90.0)	1 (10.0)	0	
Yes	8 (80.0)	2 (20.0)	0	

Course B

1. Evaluating Reaction and Satisfaction

By 6/18/2017, 76 participants have completed the evaluation form of course B and the data is shown in table 8. Statements addressing the content, design, meeting the expectations, and the willingness to recommend the course to others were rated positively by most participants (83%-91%). However, less participants (74%) felt that they are fully capable of applying the skills they learned in the course.

2. Evaluating Learning

By 6/18/2017, 87 participants completed the pre-and post-test of course B. The number of participants is different from the previous level because not all participants who finished the pre and post-test completed the evaluation form. The visual inspection of the difference histogram and normal Q-Q plot showed that the pre- and post-test results were approximately normally distributed. Using a paired T test, the pre- and post-test results of course B were significantly different ($p < 0.001$) (table 2).

On the other hand, the p-value of both statistical tests (Kolmogorov-Smirnov and Shapiro-Wilk) was significant (< 0.001), so the null hypothesis was rejected concluding that the difference was not normally distributed. Using Wilcoxon Signed-Rank Test, the p-value (< 0.001) was statistically significant, so the post-test scores were statistically significantly different from the pre-test scores for course B (Table 3).

3. Course B Post-Training Survey

Eight out of 34 participants who received the questionnaire for course B completed it (23.5%). The demographic characteristics of the participants are shown in table 9. All

participants completed the questionnaire within a year of taking the course. As with course A, most participants were environmental health inspectors (50%), followed by epidemiologists (25%), laboratorians (12.5%), and physician/veterinarian (12.5%). The participants' years of experience varied from 0 to 34 years with a median of 8.

The majority of participants (88%-100%) responded positively to all items measuring their perception of knowledge gained and improved performance except one item (Table 10 & Table 11). Participants did not respond as positively (62.5%) to the statement addressing whether the course helped them improve their ability to respond to laboratory-identified clusters. Overall, all participants (100%) perceived that the course had improved their overall job performance when responding to foodborne disease outbreaks.

Table 8: Responses to the Evaluation Form that was completed immediately after taking Course B through the Center for Agriculture and Food Security and Preparedness website (n= 76)

The Positive Statement	**Strongly Agree N (%)**	**Agree N (%)**	**Neither N (%)**	**Disagree N (%)**	**Strongly Disagree N (%)**
The course content supported the learning objectives.	22 (29%)	46 (60%)	8 (11%)	0	0
The course materials and learning aids effectively conveyed the course content.	22 (29%)	47 (62%)	7 (9%)	0	0
The course contained useful activities to practice and reinforce the learning objectives.	17 (22%)	47 (62%)	9 (12%)	3 (4%)	0
The course provided the knowledge and skills I need to accomplish the job for which I am receiving this training.	14 (18%)	50 (66%)	12 (16%)	0	0
Based on the training received, I am fully capable of applying the skills I learned from this course.	9 (12%)	47 (62%)	17 (22%)	3 (4%)	0
The course content was appropriate for someone within my professional field.	17 (22%)	47 (62%)	10 (13%)	2 (3%)	0
The course content was appropriate for someone with my level of experience.	12 (16%)	51 (67%)	11 (14%)	2 (3%)	0
Overall, the course content met my needs and expectations.	13 (17%)	52 (69%)	11 (14%)	0	0
Overall, the course increased my knowledge, skills and abilities.	17 (22%)	51 (67%)	8 (11%)	0	0
I would recommend this course to my peers.	15 (20%)	49 (64%)	12 (16%)	0	0

Table 9: Characteristics of the participants of Course B post-training survey (n=8)

Characteristics	Frequency (n)	Percent (%)
Gender		
Male	3	37.50
Female	5	62.50
Job Sector		
State	5	62.50
Local	2	25
Academia	1	12.50
Primary Role at Agency		
Environmental Inspector	4	50.00
Epidemiologist	2	25.00
Laboratorian	1	12.50
Physician\Veterinarian	1	12.50
Years of Experience		
< 5	3	37.5
5 to 10	2	25.00
> 10	3	37.5
Supervisory Responsibility at Agency		
Yes	2	25.00
No	6	75.00
Completion of Online Course, months		
0-5	4	50
6-12	4	50
13-18	0	0
Completion of Part A Prior to taking Part B		
Yes	8	100
No	0	0
Post-Course Participation in Investigation		
Yes	4	50
No	4	50

Table 10: Responses to Course B post-training survey aimed at evaluating the participants' perception of knowledge gained and impact on performance (n=8)

The Positive Statement *Completion of the course helped me better understand/improve*	**Strongly Agree N (%)**	**Agree N (%)**	**Neither N (%)**	**Disagree N (%)**	**Strongly Disagree N (%)**
environmental health surveillance systems.	4 (50.00)	4 (50.00)	0	0	0
epidemiological surveillance systems.	4 (50.00)	4 (50.00)	0	0	0
laboratory surveillance systems	4 (50.00)	3 (37.50)	0	1 (12.50)	0
routine and non-routine foodborne outbreaks.	3 (37.50)	4 (50.00)	1 (12.50)	0	0
role of complaint systems in identifying FDO*.	3 (37.50)	4 (50.00)	1 (12.50)	0	0
role of different members in responding to local complaint-driven clusters.	3 (37.50)	5 (62.50)	0	0	0
role of team members in responding to laboratory-identified clusters.	3 (37.50)	5 (62.50)	0	0	0
my ability to respond to complaint-driven clusters.	1 (12.50)	6 (75.00)	1 (12.50)	0	0
my ability to respond to laboratory-identified clusters.	2 (25.00)	3 (37.50)	3 (37.50)	0	0
the different types of complex outbreaks.	0	8 (100.00)	0	0	0
how team composition may change during a complex FDO response.	1 (12.50)	7 (87.50)	0	0	0
indicators of an intentional contamination incident.	1 (12.50)	7 (87.50)	0	0	0
the use of the Incident Command System in supporting FDO response.	0	8 (100.00)	0	0	0
my overall job performance when responding to FDO.	1 (12.50)	7 (87.50)	0	0	0

*FDO: Foodborne Disease Outbreak

Table 11: Responses to Course B Post-Training Survey aimed at evaluating the participants' perception of knowledge gained and impact on performance (n=8) (collapsed categories of Likert Scale)

The Positive Statement *Completion of the course helped me better understand/improve*	**Agree** **N (%)**	**Neutral** **N (%)**	**Disagree** **N (%)**
environmental health surveillance systems.	8 (100)	0	0
epidemiological surveillance systems.	8 (100)	0	0
laboratory surveillance systems	7 (87.50)	0	1 (12.50)
routine and non-routine foodborne outbreaks.	7 (87.50)	1 (12.50)	0
role of complaint systems in identifying FDO*.	7 (87.50)	1 (12.50)	0
role of different members in responding to local complaint-driven clusters.	8 (100)	0	0
role of team members in responding to laboratory-identified clusters.	8 (100)	0	0
my ability to respond to complaint-driven clusters.	7 (87.50)	1 (12.50)	0
my ability to respond to laboratory-identified clusters.	5 (62.50)	3 (37.50)	0
the different types of complex outbreaks.	8 (100.00)	0	0
how team composition may change during a complex FDO response.	8 (100.00)	0	0
indicators of an intentional contamination incident.	8 (100.00)	0	0
the use of the Incident Command System in supporting FDO response.	8 (100.00)	0	0
my overall job performance when responding to FDO.	8 (100.00)	0	0

*FDO: Foodborne Disease Outbreak

Discussion and Conclusion

Course A has been available for over two years and course B for over one year. This study was the first to evaluate the satisfaction and leaning levels of participants and to capture their perception of knowledge gained and impact on their performance. The responses were mostly positive regarding the satisfaction with the course and the perception of knowledge gained and improved performance. The findings of this study are consistent with the findings of similar studies for evaluating training courses in foodborne outbreak investigation. A study evaluating a 5-day in-classroom course indicated that participants were highly satisfied with the course and that there was a statistically significant change in knowledge before and after the training. The participants also reported that they became more capable of responding to outbreak investigation and publishing more reports (Lescano, Salmon-Mulanovich, Pedroni, & Blazes, 2007). A pilot study conducted by Stehr-Green and Gathany (2005) found that most participants (n=17) reacted positively to the online discussion following a computer-based case study and suggested that incorporating the human interactivity through online discussion would be effective in improving learning. Many studies have reported that online courses were effective in improving food safety and medical knowledge through pretest-posttest comparison (da Cunha, Stedefeldt, & de Rosso, 2014; Shaw et al., 2016; Wang, Feng, Tam, Sun, Zhou, & So, 2016)

As the public health workforce is suffering from financial and staff shortages and due to the high cost and implementation requirements of field training programs, more immediate methods, such as online courses, can be an alternative to building a skilled workforce for outbreak investigation (Lescano, Salmon-Mulanovich, Pedroni, & Blazes, 2007; Stehr-Green & Gathany, 2005).

However, the level 3 survey has limitations of small sample size (n=20) (n=8) and low response rate (18.7%), (23.5%) for course A and B, respectively. With this sample size, it was not possible to test the significance of the association between the perception of the overall course impact on performance and other variables. It was a convenience sample, which may suggest potential bias. The participation was voluntary and limited to those who completed the training courses. In addition, the participants varied in the years of experience, the job sector, the role at agency, and other variables, but the sample was not representative of all the different team members of outbreak investigation and thus the results cannot be generalized to the target population. Moreover, ideally the follow-up evaluations should be done 3 to 9 months after training (D. Kirkpatrick & J. Kirkpatrick, 2006); however, the study included participants who completed course A up to two years ago, which may have affected the ability to reach the participants due to frequent turnover of staff and impacted the validity of their evaluation. The timing of distributing the survey may have negatively impacted the response rate as it was distributed 3 weeks before Christmas. Another suggested reason for the low response rate may be related to the busy work schedules of public health professionals, especially those who are working in the fields of outbreak investigation and inspection of food facilities.

In general, the response rate to e-mail and web surveys ranges from 25% to 30% without follow-up emails (Yun & Trumbo, 2000). However, the response rate to this study was lower even though three reminders were sent. Some studies suggested that the response rate can be improved using multimode approaches, for example, providing the options of mail and email survey instruments to respondents (Schaefer & Dillman, 1998; Yun & Trumbo, 2000).

Kaplowitz, Hadlock and Levine (2004) reported that a mailed notification to potential participants before survey administration enhanced the response rate.

Finally, part of this study relied on self-reporting of knowledge and behavior change, so more research is needed to assess the actual effect of the course on participants' performance in the field using rigorous quantitative measures and larger samples. In addition, it is important that the CAFSP develops new strategies to increase the response rate to evaluation studies. For example, offering incentives or an extra free training may be effective. In addition, gathering information about the work schedules and duties of public health professionals would be helpful in figuring out the best time and procedure for collecting data.

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APPENDIX

Appendix A- Course A Post-Training Survey

Course 1 Foodborne Outbreak Investigation and Response Team Roles and Responsibilities: Part A - Post-Training Survey

INTRODUCTION

You are invited to participate in a research study by the Center for Agriculture and Food Security and Preparedness (CAFSP). The research aims to evaluate the performance of the online course "Course 1 Foodborne Outbreak Investigation and Response Team Roles and Responsibilities, Part A" that you have completed. The purpose of this survey is to assess the impact of the training course on the participants' performance.

INFORMATION ABOUT PARTICIPANTS' INVOLVEMENT IN THE STUDY

Your involvement in the study would include completion of a 5- 10 minute survey.

RISKS

The only risk to participation is a breach of confidentiality. This risk is highly unlikely and many steps have been taken to minimize that risk including having the software not record your IP address and not asking you to identify yourself or your institution.

BENEFITS

Benefits to your participation include the collection of information that could be used to assess your perception of the process of foodborne disease outbreak investigation and the impact of the training on your performance and thus improving the course.

CONFIDENTIALITY

The information in the study records will be kept confidential. Data will be stored securely and will be made available only to persons conducting the study. No reference will be made in oral or written reports which could link participants to the study.

CONTACT INFORMATION

If you have questions at any time about the study or the procedures, you may contact Amal Humidat, at ahumidat@vols.utk.edu, or Dr. Sharon Thompson, at sthomps4@utk.edu. If you have questions about your rights as a participant, you may contact the University of

Tennessee IRB Compliance Officer at utkirb@utk.edu or (865) 974-7697.

PARTICIPATION

Your participation in this study is voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at any time without penalty and without loss of benefits to which you are otherwise entitled. If you withdraw from the study before data collection is completed your data will be destroyed.

CONSENT

I have read the above information. I have received (or had the opportunity to print) a copy of this form. clicking on the button to continue and completing the survey (questionnaire) constitutes my consent to participate.

- ○ I agree
- ○ I do not wish to participate in the survey

Please indicate when you completed this course.

- ○ 0-5 months ago
- ○ 6-12 months ago
- ○ 13-18 months ago
- ○ 19-24 months ago
- ○ Over 24 months ago

Please indicate your primary job sector.

- ○ Federal
- ○ State
- ○ Local
- ○ Tribal/ Territorial
- ○ Academia
- ○ Industry
- ○ Others, please specify

Please indicate your primary role at your agency / organization.

- ○ Environmental Health Inspector
- ○ Epidemiologist
- ○ Laboratorian
- ○ Physician\Veterinarian
- ○ Public Health Nurse
- ○ Health Educator
- ○ Public Information Officer
- ○ Others, please specify

What is your gender?

- ○ Male
- ○ Female
- ○ Others, please specify

Years of experience:

years

Do you have a supervisory responsibility at your agency?

- ○ Yes
- ○ No

Did you complete any training in foodborne disease outbreak investigations prior to taking this course?

- ○ Yes
- ○ No

Have you participated in a foodborne disease outbreak investigation after completing this course?

- ○ Yes
- ○ No

Please answer the questions by identifying the number that corresponds to your response.

Completion of the course,

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
Improved my understanding of the integrated food safety system.	O	O	O	O	O	O
Improved my understanding of how local, state and federal agencies fit into an integrated food safety system.	O	O	O	O	O	O
Helped me understand key terms describing foodborne disease outbreaks.	O	O	O	O	O	O
Helped me understand the goals of a foodborne disease outbreak investigation.	O	O	O	O	O	O
Helped me understand my role during a foodborne disease outbreak investigation.	O	O	O	O	O	O

Please answer the questions by identifying the number that corresponds to your response.

Completion of the course,

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
Helped me identify the roles of other team members during a foodborne disease outbreak investigation.	O	O	O	O	O	O
Helped me understand the importance of coordination between team members during a foodborne disease outbreak investigation and response.	O	O	O	O	O	O
Helped me identify potential barriers to effective foodborne disease outbreak investigation and response.	O	O	O	O	O	O
Helped me identify important considerations when dealing with the media regarding a foodborne disease outbreak.	O	O	O	O	O	O
Improved my overall job performance when responding to foodborne disease outbreaks.	O	O	O	O	O	O

After completion of the course,

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
I have improved my communications with foodborne disease outbreak team members **BEFORE** a foodborne disease outbreak occurs.	O	O	O	O	O	O
I have improved my communications with other foodborne disease outbreak team members **DURING** a foodborne disease outbreak investigation.	O	O	O	O	O	O
I have improved my communications with other foodborne disease outbreak team members **AFTER** a foodborne disease outbreak investigation concludes.	O	O	O	O	O	O

Additional comments:

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Appendix B- Course B Post-Training Survey

Course 2 Foodborne Outbreak Investigation and Response Team Roles and Responsibilities: Part B - Post-Training Survey

INTRODUCTION

You are invited to participate in a research study by the Center for Agriculture and Food Security and Preparedness (CAFSP). The research aims to evaluate the performance of the online course "Course 2 Foodborne Outbreak Investigation and Response Team Roles and Responsibilities, Part B" that you have completed. The purpose of this survey is to assess the impact of the training course on the participants' performance.

INFORMATION ABOUT PARTICIPANTS' INVOLVEMENT IN THE STUDY

Your involvement in the study would include completion of a 5-10 minute survey.

RISKS

The only risk to participation is a breach of confidentiality. This risk is highly unlikely and many steps have been taken to minimize that risk including having the software not record your IP address and not asking you to identify yourself or your institution.

BENEFITS

Benefits to your participation include the collection of information that could be used to assess your perception of the process of foodborne disease outbreak investigation and the impact of the training on your performance and thus improving the course.

CONFIDENTIALITY

The information in the study records will be kept confidential. Data will be stored securely and will be made available only to persons conducting the study. No reference will be made in oral or written reports which could link participants to the study.

CONTACT INFORMATION

If you have questions at any time about the study or the procedures, you may contact Amal Humidat, at ahumidat@vols.utk.edu, or Dr. Sharon Thompson, at sthomps4@utk.edu. If you have questions about your rights as a participant, you may contact the University of Tennessee IRB Compliance Officer at utkirb@utk.edu or (865) 974-7697.

PARTICIPATION

Your participation in this study is voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at any time without penalty and without loss of benefits to which you are otherwise entitled. If you withdraw from the study before data collection is completed your data will be destroyed.

CONSENT

I have read the above information. I have received (or had the opportunity to print) a copy of this form. Clicking on the button to continue and completing the survey (questionnaire) constitutes my consent to participate.

- ○ I agree
- ○ I do not wish to participate in the survey

Please indicate when you completed this course.

- ○ 0-5 months ago
- ○ 6-12 months ago
- ○ 13-18 months ago

Please indicate your primary job sector.

- ○ Federal
- ○ State
- ○ Local
- ○ Tribal/ Territorial
- ○ Academia
- ○ Industry
- ○ Others, please specify

Please indicate your primary role at your agency / organization.

- ○ Environmental Health Inspector
- ○ Epidemiologist
- ○ Laboratorian
- ○ Physician\Veterinarian
- ○ Public Health Nurse
- ○ Health Educator
- ○ Public Information Officer
- ○ Others, please specify

What is your gender?

- ○ Male
- ○ Female
- ○ Others, please specify [ ]

Years of experience:

[ ] Years

Do you have a supervisory responsibility at your agency?

- ○ Yes
- ○ No

Did you complete Course 1 Foodborne Outbreak Investigation and Response Team Roles and Responsibilities: Part A prior to taking this course?

- ○ Yes
- ○ No

Have you participated in a foodborne disease outbreak investigation after completing this course?

- ○ Yes
- ○ No

Please answer the questions by identifying the number that corresponds to your response.

Completion of the course,

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
Improved my understanding of **environmental** health surveillance systems relevant to foodborne outbreak response.	○	○	○	○	○	○
Improved my understanding of **epidemiological** surveillance systems relevant to foodborne outbreak response.	○	○	○	○	○	○
Improved my understanding of **laboratory** surveillance systems relevant to foodborne outbreak response.	○	○	○	○	○	○

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
Helped me differentiate between routine and non-routine foodborne outbreaks.	O	O	O	O	O	O
Helped me understand the role of complaint systems in identifying foodborne disease outbreaks.	O	O	O	O	O	O
Helped me understand the role of different outbreak team members in responding to local complaint-driven clusters.	O	O	O	O	O	O
Helped me understand the role of outbreak team members in responding to laboratory-identified clusters.	O	O	O	O	O	O

After completion of the course,

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
I have improved my ability to respond to complaint-driven clusters.	O	O	O	O	O	O
I have improved my ability to respond to laboratory-identified clusters.	O	O	O	O	O	O

Completion of the course,

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable
Helped me understand the different types of complex outbreaks.	O	O	O	O	O	O
Helped me understand how team composition may change during a complex foodborne disease outbreak response.	O	O	O	O	O	O
Helped me understand indicators of an intentional contamination incident.	O	O	O	O	O	O
Helped me improve my understanding of the use of the Incident Command System in supporting foodborne outbreak response.	O	O	O	O	O	O
Improved my overall job performance when responding to foodborne disease outbreaks.	O	O	O	O	O	O

Additional comments:

Appendix C- Permission to Conduct Research

THE UNIVERSITY OF
TENNESSEE
KNOXVILLE

November 29, 2016

Amal Humidat,
UTK - Biomedical and Diagnostic Sciences

Re: UTK IRB-16-02951-XP
Study Title: The final title has not been determined yet.Evaluation of the Performance of the Center of Excellence Web Training Courses developed by the Center for Agriculture and Food Security and Preparedness.

Dear Amal Humidat:

The UTK Institutional Review Board (IRB) reviewed your application for the above referenced project. It determined that your application is eligible for expedited review under 45 CFR 46.110(b)(1), category/ies (5) and (7). The IRB has reviewed these materials and determined that they do comply with proper consideration for the rights and welfare of human subjects and the regulatory requirements for the protection of human subjects.

Therefore, this letter constitutes full approval by the IRB of your application (version 1.2) as submitted, including Consent Cover Statement 1 (version 1.0); Consent Cover Statement 2 (version 1.0); course 1 survey (version 1.0); course 2 survey (version 1.0) which have been dated and stamped IRB approved. Approval of this study will be valid from 11/29/2016 to 11/28/2017.

In accord with 45 CFR 46.116(d), informed consent may be altered, with the cover statement used in lieu of an informed consent interview. The requirement to secure a signed consent form is waived under 45 CFR 46.117(c)(2). Willingness of the subject to participate will constitute adequate documentation of consent.

In the event that subjects are to be recruited using solicitation materials, such as brochures, posters, web-based advertisements, etc., these materials must receive prior approval of the IRB. **Any revisions in the approved application must also be submitted to and approved by the IRB prior to implementation, including any increase in the total number of approved participants (currently 155) necessary to accomodate all surveyed + all whose de-identified data are provided to you.** In addition, you are responsible for reporting any unanticipated serious adverse events or other problems involving risks to subjects or others in the manner required by the local IRB policy.

Institutional Review Board | Office of Research & Engagement
1534 White Avenue Knoxville, TN 37996-1529
865-974-7697 865-974-7400 fax irb.utk.edu

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Finally, re-approval of your project is required by the IRB in accord with the conditions specified above. You may not continue the research study beyond the time or other limits specified unless you obtain prior written approval of the IRB.

Sincerely,

Colleen P. Gilrane

Colleen P. Gilrane, Ph.D.
Chair

Institutional Review Board | Office of Research & Engagement
1534 White Avenue Knoxville, TN 37996-1529
865-974-7697 865-974-7400 fax irb.utk.edu

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VITA

Amal Humidat was born in Jerusalem, Palestine to Saleh and Eman Humidat. She attended elementary school through high school in Hebron. She has always been passionate about working to improve the well-being of humanity by contributing to science. After graduating from high school, she began her journey towards this passion and decided to enroll in the Pharmacy program at An-Najah National University. A year later, however, she realized that Pharmacy was not her calling as it was a theoretical-based program. She was looking for a program that would qualify her to work in research, and she found that in the Department of Biotechnology at the same university. She obtained a Bachelor of Science degree in May 2012 in Biological Biotechnology, and then she worked as an intern at Biotechnology Research Center, Hebron. In 2014, she moved to the United States to study at the University of Tennessee. She accepted a graduate research assistantship at the University of Tennessee, Knoxville in Comparative and Experimental Medicine and worked in the Center for Agriculture and Food Security and Preparedness (CAFSP). Amal graduated with a Master of Science in Comparative and Experimental Medicine with the Graduate Certificate in Food Safety in August 2017. In fall 2017, she will begin a Doctoral program of study in the Department of Nutrition at the University of Tennessee, Knoxville.