A Dissertation

entitled

Behavioral and Environmental Attributes of Ebola Epidemic in West Africa and United States Emergency Nurses’ Motivation to Protect Themselves against Ebola Infection

by

Laurasona N.F. Leigh

Submitted to the Graduate Faculty as partial fulfillment of the requirements for the Doctor of Philosophy Degree in Health Education

Jiunn-Jye Sheu, MSPH, PhD, MCHES, Committee Chair

Tavis Glassman, PhD, MSEd, MPH, CCPH, MCHES, Committee Member

Colleen Taylor, PhD, RN, FNP-BC, Committee Member

Amy Thompson, PhD, CHES, Committee Member

Amanda Bryant-Friedrich, PhD Dean
College of Graduate Studies

The University of Toledo

August 2016
An Abstract of

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Introduction: The 2014 Ebola outbreak was considered one of the worst, with approximately 15,217 confirmed cases and 11,301 deaths. This outbreak devastated several places in Africa and unexpectedly affected countries outside of the African region such as the United States. Thus far, there is limited knowledge concerning how to prevent the spread of this highly contagious and deadly disease that has claimed between 50% and 90% of the infected. While there has been substantial research conducted on the biological and epidemiological features of the virus, there is limited research on how an individual’s health behavior contributes to the spread of the virus. Additionally, due to the sporadic occurrence of this virus, there is insufficient research regarding United States healthcare professionals and how they give care to possible patients with an Ebola infection and what they consider as their motivation to protect themselves when giving care to these patients. Methods: For the first of two related studies, an ecological analysis was conducted using data provided from three English speaking West African countries: Liberia, Nigeria and Sierra Leone. Each country’s Ministry of Health compiled an Ebola infection daily report on the confirmed, probable and suspected cases and deaths within
each district. The possible determinants of transmission were compiled from surveys conducted by each country’s Ministry of Health with assistance from credible international agencies. Spearman Rho Correlation and Stepwise Linear Regression were conducted to determine the possible determinants associated with the spread and transmission of the Ebola virus. For the second study, a non-experimental quantitative analysis using a descriptive cross sectional design was used to guide the study. A modified Protection Motivation Theory was used to develop the instrument to survey randomly selected emergency nurses whom are members of the Emergency Nurses Association. Spearman Rho Correlation, Stepwise Linear Regression and a Path Analysis were conducted for data analysis. **Results:** The findings for the first study indicate that four outcome variables (initial confirmed cases, initial suspected cases, initial probable deaths and latest confirmed deaths) provided meaningful results. Each variable was associated with multiple behavioral, environmental and social factors. These factors were significant predictors of initial confirmed cases with 65% of the variance, initial suspected cases with 73% of the variance, latest confirmed deaths with 74% of the variances and initial probable deaths with 96% of the variance. The results from the second study demonstrated a difference among emergency nurses’ protection motivation and other psychological variables. The outcome variable, *protection motivation*, was divided into *proactive protection motivation* and *passive protection motivation*. The findings revealed that *proactive protection motivation* is highly and positively correlated with *response efficacy* (.26, *p*<.01), *self-efficacy* (.18, *p*<.01), *outcome expectations* (.16, *p*<.01) and *perceived severity* (.17, *p*<.01). *Passive protection motivation* is highly and positively correlated with *perceived vulnerability* (.34, *p*<.01), *fear* (.24, *p*<.01), *response*
cost (.3, \(p<.01\)) and outcome expectations (.18, \(p<.01\)). The path analysis indicated that outcome expectations, response efficacy and self-efficacy accounted for 13% variance (\(R^2\)) of emergency nurses’ proactive protection motivation and perceived vulnerability, response cost and knowledge accounted for 16% variance (\(R^2\)) of emergency nurses’ passive protection motivation. **Conclusion:** Ebola infection constitutes a significant public health threat; the virus will continue to claim lives of innocent victims if sufficient research is not conducted to prevent the transmission of the disease. Environmental factors are largely responsible for the transmission of the virus and increased mortality rates. These factors are related to preventive methods that can limit the spread of the disease. Additionally, countries with low disease prevalence need to be aware of the psychological variables that affect healthcare professionals who might provide care to possible patient with the disease. Self-efficacy, response efficacy, outcome expectations, perceived vulnerability, response cost and knowledge are associated with both proactive and passive protection motivation. Additionally, demographic variables such as gender, age, employment setting and current licensure contribute to the individual’s proactive and passive protection motivation. Efforts are suggested to improve environmental conditions within areas with high prevalence of the disease, increase training on Ebola infection control and provide the necessary equipment and accommodations at healthcare facilities.

**Keywords:** Ebola virus disease, Ebola infection control, Emergency Nurses, West Africa, Protection Motivation Theory, Ecological Model
Dedicated to my parents, Coulsona Leigh and Emmanuel Leigh. Thank you for all the love and support throughout my academic journey and for helping me achieve my goals.
Acknowledgements

I could not have accomplished this dissertation without the guidance and support of my chair, Dr. Jiunn-Jye Sheu. Thank you for all the time, energy and effort you provided in helping me understand and assisting me with the research process. Thank you to each of my committee members: Dr. Tavis Glassman, Dr. Colleen Taylor and Dr. Amy Thompson. I really appreciate your comments, suggestions and guidance throughout the dissertation process.

Thank you to the University of Toledo, Office of Institutional Research for their assistance with developing my online survey. I really appreciate the constant support that was provided by their office secretary, Robin Kuhl. Finally, thank you to the University of Toledo Medical Center Emergency Department Nurses for providing constructive feedback and participating in my instrument testing.
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List of Abbreviations

CDC ...................... Centers for Disease Control and Prevention
ENA ...................... Emergency Nurses Association
KR-20 .................... Kuder-Richardson Formula 20
PCA ........................ Principal Component Analysis
PMT ........................ Protection Motivation Theory
WHO ...................... World Health Organization
List of Symbols

\( \beta \) ........Beta

\( \chi^2 \) ........Chi-square

\( R^2 \) ........Coefficient of determination

\( \geq \) ........Greater than or equal to

\( > \) ........Greater than

\( < \) ........Less than

\( H \) ........Kruskal-Wallis

\( p \) ........Probability

\( t \) ........t-statistic

SD ........Standard deviation

\( \rho \) ........Spearman Correlation Coefficient Rho
Chapter One

Introduction

A. Scope of Problem

Throughout the years, the Ebola virus has devastated towns, villages and cities in regions around the world, especially Africa. This deadly lethal virus made its initial appearance in 1976 in Africa. Since its discovery, the disease has caused at least 14 outbreaks between 1976 and 2006 in Africa (Legrand, Grais, Boelle, Valleron, & Flahault, 2007).

The 2014 outbreak began in Gueckedou, Guinea and spread to its neighboring countries of Liberia and Sierra Leone and other countries within the West African region (K.A. Alexander et al., 2014). This outbreak was considered one of the worst, with approximately 3,685 probable, confirmed and suspected cases in the region, with Sierra Leone and Liberia having an estimated 2,914 cases and Guinea 771 cases in 2014 (Meltzer et al., 2014). In early 2016, the Centers for Disease Control and Prevention (CDC) reported a total of 28,603 confirmed, suspected and probable cases in Guinea (3,804), Liberia (14,124) and Sierra Leone (10,675). From this total, 15,217 were laboratory confirmed cases and 11,301 deaths (Centers for Disease Control and Prevention, 2016).

Thus far, there is very little known about this highly contagious and deadly disease that claims between 50% and 90% of the infected (Legrand et al., 2007). However, researchers have made some progress in addressing certain aspects of understanding the disease, which include the biological and epidemiological features of
the virus and the disease. Unfortunately, the rapid spread of the disease is still not understood. A detailed understanding of the factors that contribute to the swift spread of the disease could be used to reduce the disease mortality and rapid spread within and outside the infected countries.

B. Significance of the Studies

Since the Ebola virus is highly transmissible by direct contact, the research study delineated in chapter 2 aimed to determine what behavioral, environmental and social factors are associated with the rapid transmission of the disease. There are substantial amount of research on the biology and epidemiology of the Ebola virus and history of outbreaks that occurred in Africa and other countries. However, there is very limited research on what behavioral, environmental or social factors affect the transmission of the disease.

The study outlined in chapter 3 aimed to examine the perception of emergency nurses throughout the United States to explore their motivation to protect themselves when faced with possible patients with an Ebola infection they might have encountered at work. During the 2014 outbreak, the United States encountered possible patients with Ebola infection that entered the country or were transferred to the country to receive advance medical care. Since the virus sporadically occurs and most outbreaks occur in the African region, there is limited research on the care of possible patients with an Ebola infection within the United States healthcare system. In addition, there is limited research concerning the healthcare professionals and how they might give care to possible patients with an Ebola infection and what they consider as their motivation to protect themselves when giving care to these patients.
These research studies on the Ebola virus aimed to bridge the gap by using three countries in West Africa that were affected by the 2014 outbreak to determine the factors associated with the spread of the disease as well as examining U. S. emergency nurses’ motivation to protect themselves in a country where the disease has low incidence and prevalence rates.

C. Theoretical Framework

a. The Ecological Model

The Ecological Model was used to guide the research outlined in chapter 2 by identifying the behavioral, environmental and social factors that are associated with the wide spread of the Ebola virus within Liberia, Nigeria and Sierra Leone in 2014. Unlike traditional behavioral theories, the Ecological Model provides a comprehensive framework for understanding the interacting determinants of health behaviors. This is because the core concept of the model includes multiple levels of influences, which are intrapersonal, interpersonal, organizational, community and public policy (Sallis, Owen, & Fisher, 2008).

Each of the levels in the model explains the framework for understanding a correlated factor to a disease. The intrapersonal level focuses on the biological aspects of the individuals and their behavior. The interpersonal level focuses on the social and cultural aspects of the individuals. Organizational, community and public policy levels focus more on all aspects of the districts within each country (Sallis et al., 2008).

The social norms, cultural values and environmental factors are influential in getting the entire picture of the spread of the disease within each country.
Concerning social norms and cultural values, these entail behavioral factors that involve various human contacts. For example, hand washing, treatment of diseases, sexual intercourse, disposal of human waste, and household size are important variables to assess.

The environmental factors and external influences that could affect the transmission of the Ebola virus include the amount of health facilities available, barriers when accessing health care, number of health workers available, annual health expenditure, source of drinking water, education, type of sanitation facilities and availability of soap and water for hand washing.

The strength of the Ecological Model provides multiple levels that not only involves the environment but also focuses on the psychological, social and organizational influences (Sallis et al., 2008). In this study, the Ecological Model provides a complete framework to address the behavioral, environmental and social factors associated with the spread of the Ebola virus.

b. The Protection Motivation Theory

The Protection Motivation Theory was used to guide the research study outlined in chapter 3 to investigate United States emergency nurses’ motivation to protect themselves when caring with patients who may have an Ebola infection. Unlike other health behavior theories, this theory provides a social cognitive account of protective behavior (Milne, Sheeran, & Orbell, 2000). Multiple theories such as the Health Belief Model and Theory of Reasoned Action attempt to explain how protective behaviors are started or maintained. Whereas, the Protection Motivation Theory was developed to provide clarity on the area of fear
 appeals, in order to explain attitude and behavior change through matching cognitive processes people use to evaluate threats and selecting coping alternatives (Floyd, Prentice-Dunn, & Rogers, 2000). Refer to Figure 1.1 for a pictorial representation of the modified Protection Motivation Theory.

![Figure 1.1: Modified Protection Motivation Theory](image)

The structure of the Protection Motivation Theory was based on the value expectancy theory (Ward, 1954), but it was revised to include additional components that expanded the information sources that could initiate a coping process (Floyd et al., 2000; Milne et al., 2000). The theory focuses on the cognitive meditational processes, which involves the maladaptive and adaptive responses. The maladaptive responses are behaviors that put the individuals’ health at risk and the adaptive responses are protective actions (Boer & Seydel,
1996). These two responses are processed as the threat appraisal and coping appraisal, which is how each construct for the fear appeal is separated (Rippetoe & Rogers, 1987).

Within the theory, threat appraisal includes *perceived vulnerability* and *perceived severity*. *Perceived vulnerability* assesses the likelihood of contacting the communicated threat (Milne et al., 2000) and *perceived severity* assesses the seriousness of the threat (Boer & Seydel, 1996). The combination of both perceived vulnerability and severity results in *fear arousal*. This is because the more an individual feels vulnerable and takes the threat seriously, their fear increases and the greater the appraised threat (Milne et al., 2000).

Coping appraisal determines the components that are relevant in evaluating the individual’s expectation to conduct the recommended coping response to the appraised threat (Milne et al., 2000). With regards to the components for coping appraisal, these include *response efficacy*, *self-efficacy* and *response cost*. *Response efficacy* assesses the belief that the recommended coping response might be effective in reducing the individual’s threat, *self-efficacy* assesses the perceived ability to perform the recommended coping response and *response cost* assesses the cost associated with performing the recommended preventive behavior (Milne et al., 2000).

To enhance this study, two additional constructs: *knowledge* and *outcome expectations* were included to modify the Protection Motivation Theory. The construct *knowledge* is found in other health behavior theories such as the Integrated Behavioral Model. Within the Integrated Behavioral Model, intention
to perform a behavior is considered the most important determinant of a behavior, however knowledge is needed to carry out the behavior (Montano & Kasprzyk, 2008). In this study, protection motivation is the outcome variable and knowledge acquired could influence emergency nurse’s protection motivation if they might have encountered possible patients with an Ebola infection at work.

The construct outcome expectation is part of the Social Cognitive Theory. Within this theory, the expected outcome is the belief that multiple consequences might result from the behaviors a person chooses to perform (McAlister, Perry, & Parcel, 2008). Outcome expectation affects the lifestyle choices of an individual and contributes to their health behavior. The expectations can serve as an incentive (physical pleasures) or as a disincentive (physical discomfort or pain) (Bandura, 1998). The construct has been effective in addressing studies that focused on health behavior changes such as condom and tobacco use (McAlister et al., 2008). In this study, outcome expectation is a maladaptive response that examines the emergency nurse’s belief in the consequences when not performing a particular behavior.

The outcome variable, protection motivation, results from both the threat and coping appraisals. It is a mediating variable that functions to arouse, sustain and direct protective health behavior within the study participants (Boer & Seydel, 1996). In other words, the study outcome indicates emergency nurses’ individual motivation to protect themselves from possible patients with an Ebola infection they might have encountered at work.
The Protection Motivation Theory has been used in multiple research studies that focused on health promotion, disease prevention and injury prevention such as car safety, bicycle helmets, environmental hazards and protection of others (Floyd et al., 2000). Studies that have used this theory use it as a framework for health education interventions designed to influence health behavior changes. Currently, the theory has been applied to fields such as alcohol reduction, healthy lifestyle enhancement, enhancing diagnostic health behaviors and disease prevention (Boer & Seydel, 1996).

The use of the Protection Motivation Theory is related to disease prevention that addresses the predictive components with respect to the disease (Boer & Seydel, 1996). For this research study, the emergency nurses’ motivation to protect themselves relates to their behavioral intention to assist any possible patient with an Ebola infection. According to Floyd et al, the output of the appraisal mediating process is the intention to initiate, continue or inhibit the applicable coping modes, which is why the dependent variables for the theory are measures of behavioral intention (Floyd et al., 2000).

D. Literature Review of the Ebola Virus

This section consists of a review of the Ebola virus related to the morbidity and mortality as well as a brief historical review of the disease. Additionally, a detailed epidemiological review and cultural aspects associated with this lethal disease is provided. The section concludes with a synopsis of the research studies.

a. History of the Ebola Virus
The first documented case of the Ebola virus occurred in 1976, when it resulted in an epidemic in southern Sudan and northern Democratic Republic of Congo (formerly known as Zaire) simultaneously. Both countries share a border in the towns of Nzara and Mardi, which were affected by the disease between June and November 1976 (Pourrut et al., 2005). Workers at a cotton factory in Nzara were believed to be the origin of the disease that later spread to Mardi due to the large and active hospital (Khan et al., 1999). The first wave of the outbreak claimed 150 of the 284 victims, which resulted in a mortality rate of 53% over a period of 5 months in Sudan (Pourrut et al., 2005).

The second wave of the outbreak occurred in the Democratic Republic of Congo between August and November 1976, at Yambuku, which is 800 kilometers away from Nzara (Pourrut et al., 2005). Needle misuse in a mission hospital was believed to be the origin during the second wave (Khan et al., 1999). This is because five syringes and needles were given to the nursing staff each morning to use at the outpatient department, prenatal clinic and the impatient ward. These syringes and needles were not sterilized between use with different patients and were sometimes boiled at the end of the day (Report of an International Commission, 1978).

In the Democratic Republic of Congo, 284 of the 318 infected dead resulting in a mortality rate of 89% over a period of 2 months. This deadly and unnamed disease that claimed countless lives during this period was named after the Ebola River, in honor of its place of origin (Pourrut et al., 2005). Ever since it’s initial discovery, the Ebola virus has made sporadic appearances throughout
the years in different regions around the world but it continues to have a
devastating effect in Africa whenever it is around. Due to these outbreaks being
sporadic, not much is known about this highly deadly virus. However, clinical
researchers have made some progress over years.

b. Epidemiology of the Ebola Virus

Researchers have made substantial improvement in identifying the
transmission, symptoms and additional biological information regarding the Ebola
virus. Since it was discovered in 1976, researchers have identified five subtypes
of the virus: Zaire ebolavirus, Sudan ebolavirus, Reston ebolavirus, Tai Forest
ebolavirus (formerly Cote d’Ivoire ebolavirus) and Bundibugyo ebolavirus
(European Centre for Disease Prevention and Control, 2014).

Reston ebolavirus originated from Asia and has never caused an Ebola
infection in humans (Pourrut et al., 2005). Tai Forest ebolavirus was discovered
in 1994 in Cote d’Ivoire (Ivory Coast), when a female Swiss ethnologist became
ill after performing an autopsy on a dead chimpanzee in the Tai National Park.
The Ebola virus was confirmed in both the chimpanzee and the woman but the
woman survived the infection. No other disease report has been associated with
the Tai Forest ebolavirus (Pourrut et al., 2005; Towner et al., 2008). Bundibugyo
ebolavirus was discovered in 2007 in the Bundibugyo district in Western Uganda.
It is distantly related to the Tai Forest ebolavirus, however 37 out of 149 victims
of the Uganda outbreak died, causing a 25% mortality rate (Centers for Disease
Control and Prevention, 2010; Towner et al., 2008). The Sudan ebolavirus and
Zaire ebolavirus were discovered during the initial discovery of the disease. They
are responsible for causing most of the outbreaks in Africa, with a case fatality rate of 50% and 80% respectively (Pourrut et al., 2005). The Zaire ebolavirus is believed to be the cause of the 2014 outbreak in West Africa (Bausch & Schwarz, 2014).

In addition to the discovery of the virus subtypes, clinical researchers have determined that the incubation period for the disease varies between 2 to 21 days. Symptoms such as fever, diarrhea, abdominal pain, headache, sore throat, conjunctivitis and many other indicators occur during the incubation period before leading to multiple organ failure and, at the end, death (European Centre for Disease Prevention and Control, 2014; Legrand et al., 2007).

The Ebola virus is highly infectious among human beings and it can be contracted from direct contact with any infected blood, secretions, tissues, organs or bodily fluids from a living or dead infected person (European Centre for Disease Prevention and Control, 2014). In addition, it has been noted that the virus can persist in vaginal secretions and seminal fluids for about 3 months, which leads to the conclusion that the Ebola virus can possibly be transmitted sexually (Umeora, Emma-Echigu, Umeora, & Ajay, 2014). Even with extensive research, researchers are still unsure of the reservoir for this lethal virus. Researchers have hypothesized that bats are the possible reservoir for the virus (European Centre for Disease Prevention and Control, 2014) because bats were discovered in the warehouses of a cotton factory, where the outbreaks in 1976 and 1979 in Nzara, Sudan originated. Also, bats were present for multiple other outbreaks that occurred worldwide (Pourrut et al., 2005).
Apart from bats being considered as a common factor in past outbreaks, other outbreaks identified animal carcasses as the mode of transmission to humans. The outbreaks that occurred in the border region of Gabon and Republic of Congo between 2001 and 2003 were documented that people who handled animal carcasses such as gorillas and chimpanzees found in the forest were the index cases for these outbreaks. The virus reservoir for this disease is still unknown, however multiple studies regarding the outbreaks have provided insightful information. Based on these past outbreaks, animal species such as primates and great apes are hypothesized to come in contact with the possible reservoir (bats) due to their competition for fruits during the dry season. These infected animal species become carriers for the virus and potential sources that infect humans (Pourrut et al., 2005; Rizkalla, Blanco-Silva, & Gruver, 2007).

The rapid movement of the virus between human beings is another missing piece in the spread of the Ebola virus. Even with the determination of the primary mode of transmission between humans, factors related to the rapid spread of the virus are still relatively unknown. Socio-cultural factors are believed to have significantly contributed to the spread of the Ebola virus, especially cultural practices within the region (Chowell & Nishiura, 2014; Hewlett & Amola, 2003).

c. Cultural Examination of the Ebola Virus

The Ebola virus is believed to be zoonotic initially, transmitted from animals to humans then humans to humans. Due to this, cultural, behavioral and social factors could contribute to the rapid spread of this lethal virus. Cultural diversity within each country has shaped African nations, which can influence the
social cohesion and communication especially during times of disturbance. For example, in Liberia, there are at least 16 major ethnic and cultural groups with specific languages, religions, traditions and customs. As a result, multiple cultural and behavioral practices within the household and community could be associated with the spread of the Ebola virus (K.A. Alexander et al., 2014).

Population growth, poverty, war and poor health infrastructure have had a substantial effect on spread of the disease. With regards to population growth, the African region has increased dramatically with a population density increase of 223% in Guinea, 178% in Sierra Leone and 275% in Liberia since the 1960s. This is due to rural to urban migration caused by decades of civil unrest and possible improvements in socioeconomic conditions within the urban area. Due to these conditions and others, the virus is able to easily move throughout the region because of the increased urban population and environment that can weaken the public health resources (K.A. Alexander et al., 2014).

Hunting and butchering wildlife is believed to be the way the virus is transmitted from animals to humans. Researchers have shown that hunting and eating wildlife within the African region has increased substantially since the development of roads, which provided easier access to the forest (Rizkalla et al., 2007). This leads to the ‘bush meat’ hypothesis, which states that, “hunting, slaughtering and eating infected gorilla or monkey meat is the primary case of the virus’s entrance into a new population” (Jones, 2011). Apes make up about 1% of the ‘bush meat’ trade, with approximately 15,000 chimpanzees and 6,000 gorillas killed each year across the region (Rizkalla et al., 2007).
The correlation between an outbreak of the Ebola virus and the disappearance of certain primates have been seen in previous outbreaks such as the 2003 Congo outbreak, which had 35 cases and 39 deaths (Rizkalla et al., 2007). ‘Bush meat’ is considered the preferred protein for some regions. In Liberia it accounts for three quarters of the country’s meat use. Rapid human migration to urban areas has increased food production pressure, which has made ‘bush meat’ an important commercial commodity (K.A. Alexander et al., 2014).

The consumption of ‘bush meat’ is associated with the African culture and beliefs. Some Africans do not understand or want to limit their exposure to dead or sick animals because they believe occult forces are behind the Ebola outbreak. Due to this, locals subscribe to traditional healers to address these outbreaks. However some healers have caused the amplification of outbreaks (Jones, 2011). This is the result of the healer becoming sick due to exposure to an infected person but continues to treat other patients by cutting and sucking poisons from the ill (Hewlett & Amola, 2003). Along with traditional healers, traditional medicines and cures contribute to the increased deaths. In the Ugandan outbreak of 2000-2001, individuals drank bleach as a way to get rid of the disease (K.A. Alexander et al., 2014).

Another cultural aspect to the spread of the disease relates to having some type of contact with the corpse of an infected person. Burial practices and funerals have been identified in the role of Ebola virus transmission, causing about 60% of the cases in Guinea (K.A. Alexander et al., 2014). In some African cultures, the body of the deceased is prepared by a relative, who removes the clothes, wash and
dress the body. At the funerals, all family members ritually wash their hands in a common bowl and when the casket is opened everyone is welcome to touch the face of the deceased. Finally, the body is buried near the household (Hewlett & Amola, 2003). In the 2000-2001 Uganda outbreaks, 67% of the infected women were caused by traditional burial practices within the country (K.A. Alexander et al., 2014).

Researchers have made substantial progress since the Ebola virus was discovered. However, there are gaps in the research on the health behavior aspects related to the spread of the Ebola virus. Some researchers have examined and considered cultural factors to be attributed to this spread, but behavioral, environmental and social factors have not been the focus of any research study. Also, an examination of how health professionals such as the emergency nurses at the frontline in caring patients of possibly unknown infections in the United States address possible patients with an Ebola infection. Determining and understanding factors related to societal, behavioral and environmental aspects of the region and the motivation to protect against possible patients with an Ebola infection could assist in reducing the rapid spread of the virus.

E. Purpose Statement

The purpose of the study outlined in chapter 2 is to use the Ecological Model to identify the behavioral, environmental and social factors associated with the spread of the Ebola virus cases within districts in Liberia, Nigeria and Sierra Leone during the 2014 outbreak.
Even though the United States did not have a high prevalence rate during 2014 outbreak, the country unexpectedly received patients with the Ebola infection from the affected countries. The emergency room is the first point of entry into a hospital and the nurses have an increased risk of exposure to the Ebola virus. The purpose of the study outlined in chapter 3 is to use a modified Protection Motivation Theory to explore United States emergency nurses’ motivation to protect themselves against possible patients with an Ebola infection they might have encountered at work and its predictors. The study aimed to examine the nurses’ protective practices and determine their apprehension to give care to a possible patient who may have an Ebola infection.

F. Research Question(s) and Research Hypotheses

The following has the research questions for the study in chapter 2 and their corresponding hypotheses. The variables included in each of the research questions are as followed:

- **Ebola mortality**: total initial and latest confirmed Ebola deaths, total initial and latest probable Ebola deaths and total initial and latest suspected Ebola deaths.
- **Ebola morbidity**: total initial and latest confirmed Ebola cases, total initial and latest probable Ebola cases and total initial and latest suspected Ebola cases.
- **Behavioral factors**: hand washing, recent sexual activity, disposal of children’s stools, exposure to mass media and employment status.
- **Environmental factors**: types of sanitation facilities, water and soap at place for hand washing, availability of soap, annual health expenditure, main source of drinking water, number of health workers, number of health facilities and barriers when accessing health care.
• **Social factors:** treatment of fever, total male/female literacy, male/female educational attainment, wealth index, number of poor, average household size and total population size.

**Research Question 1:** What is the distribution of behavioral, environmental and social factors that are related to Ebola mortality and morbidity during the 2014 outbreak?

**Research Question 2:** What are the behavioral, environmental and social factors associated with Ebola mortality and morbidity during the 2014 outbreak?

• **Null Hypothesis:** There are no behavioral, environmental and social factors significantly associated with Ebola mortality and morbidity during the 2014 outbreak.

• **Alternate Hypothesis:** There are statistically significant associations between the behavioral, environmental and social factors and Ebola mortality and morbidity during 2014 outbreak.

**Research Question 3:** What are the significant predicting behavioral, environmental and social factors for Ebola mortality and morbidity during the 2014 outbreak?

• **Null Hypothesis:** There are no statistically significant predicting behavioral, environmental and social factors for Ebola mortality and morbidity during the 2014 outbreak.

• **Alternate Hypothesis:** There are statistically significant predicting behavioral, environmental and social factors for Ebola mortality and morbidity during the 2014 outbreak.
The following has the research questions for the study outlined in chapter 3 and their corresponding hypotheses. The variables included in each of the research questions are as followed:

- **Psychological variables**: perceived vulnerability, perceived severity, outcome expectations, self-efficacy, response efficacy, fear, response costs and knowledge.

- **Demographic variables**: age, gender, race, level of education, current job, current job location, years employed in current position and source of information.

**Research Question 1:** What is the distribution of investigated and demographic variables that are related to an emergency nurses’ motivation to protect themselves against possible Ebola infection?

**Research Question 2:** What are the correlations among the investigated variables that are related to an emergency nurses’ motivation to protect themselves against Ebola infection?

- **Null Hypothesis**: Emergency nurses’ psychological variables do not correlate with their protection motivation.

- **Alternate Hypothesis**: Each of the emergency nurses’ psychological variables are significantly correlated with their motivation to protect themselves against Ebola infection.

**Research Question 3:** What are the significant predictors of the United States emergency nurses’ motivation to protect themselves against possible patients with an Ebola infection?

- **Null Hypothesis**: None of the emergency nurses’ psychological variables is a significant predictor for their motivation to protect themselves against possible patients with an Ebola infection.
• **Alternate Hypothesis:** Each of the emergency nurses’ psychological variables is a significant predictor for their motivation to protect themselves against possible patients with an Ebola infection.

**Research Question 4:** Does the modified protection motivation model estimate the causal effects among the variables *perceived vulnerability, perceived severity, response efficacy, self-efficacy, knowledge, response cost, outcome expectations, fear* and *protection motivation*?

• **Null Hypothesis:** No best fit model among these variables

• **Alternate Hypothesis:** The model estimates direct and indirect causal effects among the variables.

Refer to appendix A and appendix B for a list of each research question and hypotheses aligned with the statistical tests for each study.

**G. Definitions of Terms**

**Availability of soap:** the percent distribution of households by availability of soap in the dwelling. The variable is divided into: place for hand washing observed, place for hand washing not observed and percentage of households with soap anywhere in the dwelling. The first two sub-variables are divided into ‘soap shown,’ ‘no soap in household,’ and ‘not able/does not want to show soap.’ (National Bureau of Statistics, Department for International Development, United Nations Population Funds, & United Nations Children's Fund, 2013; UNICEF & Statistics Sierra Leone, 2011).

**Average household size:** refers to the household population divided by total households.

In this study, Liberia defined it as the number of persons per household and it
demonstrates the amount of people living and eating together and urbanization and modernization (Liberian Institute of Statistics and Geo-Information Services (LISGIS) & Ministry of Labour, 2011). In Sierra Leone, it is defined as the distribution of households by the number of household members in the region of residence (J. A. L. Kamara, 2007). No definition was provided for Nigeria.

**Confirmed cases of Ebola:** any suspected or probable cases that has resulted in a positive laboratory test for the Ebola virus (World Health Organization, 2014).

**Coping appraisal:** refers to the evaluation of an individual’s ability to cope with and avoid a possible threat (Milne et al., 2000).

**Disposal of children’s stools:** the percent distribution of the youngest children under 5 living with the mother by the manner of disposal of the child’s last fecal matter and percentage of children whose stools are disposed of safely, according to background characteristics. The variable is divided into: ‘child used toilet or latrine,’ ‘put/rinsed into toilet or latrine,’ ‘buried,’ ‘put/rinsed into drain or ditch,’ ‘thrown into garbage,’ ‘left in the open/bush/field’ and ‘other’ (Liberia Institute of Statistics and Geo-Information Services (LISGIS), Ministry of Health and Social Welfare, & ICF International Inc., 2014; National Population Commission & ICF International, 2014; Statistics Sierra Leone, Ministry of Health and Sanitation, & ICF International, 2014).

**Emergency nurses:** are nurses with the knowledge, skill and training who work primarily to manage patients presented in an emergency room of a hospital.
**Fear arousal:** an emotion that affects a person and indirectly enhances the protection motivation by increasing the perceived severity and perceived vulnerability of the threat (Boer & Seydel, 1996; Milne et al., 2000).

**Female/male educational attainment:** the percentage of distributed women/men aged 15-49 by their highest level of schooling attended or completed and median years completed, according to background characteristics. The variable is divided into no education, some primary, completed primary (completed grade 6 at the primary level), some secondary, completed secondary and more than secondary. In this study, Liberia defines completed secondary as the completion of grade 12. In Nigeria, it is defined as completing grade 3 and in Sierra Leone; it is the completion of grade 3 at the senior secondary level. (Liberia Institute of Statistics and Geo-Information Services (LISGIS) et al., 2014; National Population Commission & ICF International, 2014; Statistics Sierra Leone et al., 2014).

**Female/male employment status:** the percentage of women/men between the ages of 15-49 by their employment status, according to background characteristics. The variable is divided into currently and not currently employed. The variable; currently employed is defined as having done work in the past seven days. Included persons who did not work in the past seven days but who are regularly employed and were absent from work for leave, illness, vacation or any other such reason (Liberia Institute of Statistics and Geo-Information Services (LISGIS) et al., 2014; National Population Commission & ICF International, 2014; Statistics Sierra Leone et al., 2014).
**Female/Male exposure to mass media:** the percentage of women/men between the age of 15-49 who are exposed to specific media on weekly basis, by background characteristics. The variable is divided into: ‘reads a newspaper at least once a week,’ ‘watches television at least once a week,’ ‘listens to the radio at least once a week,’ ‘accesses all three media at least once a week’ and ‘accesses none of the three media at least once a least’ (Liberia Institute of Statistics and Geo-Information Services (LISGIS) et al., 2014; National Population Commission & ICF International, 2014; Statistics Sierra Leone et al., 2014).

**Female/male literacy:** the distribution of women/men between the age of 15-49 by the level of schooling attended and level of literacy and percentage literate, according to background characteristics. The variable is divided into: ‘secondary school/higher,’ ‘can read a whole sentence,’ ‘can read part of a sentence’ and ‘cannot read at all’ (Liberia Institute of Statistics and Geo-Information Services (LISGIS) et al., 2014; National Population Commission & ICF International, 2014; Statistics Sierra Leone et al., 2014).

**Female/male recent sexual activity:** the percentage of women/men between the ages of 15-49 by the timing of the last sexual intercourse, according to background characteristics. The variable is divided into: ‘within the past 4 weeks,’ ‘within 1 year,’ ‘one or more years’ and ‘never had sexual intercourse’ (Liberia Institute of Statistics and Geo-Information Services (LISGIS) et al., 2014; National Population Commission & ICF International, 2014; Statistics Sierra Leone et al., 2014).
**Hand washing:** the percentage of households in which the place most often used for washing hands was observed and among households in which the place for hand washing was observed, the percent distribution by availability of water, soap and other cleansing agents. The variable is divided into ‘percentage of households where place for hand washing was observed.’ This variable is further divided into ‘soap and water (includes soap or detergent in bar, liquid, powder or past form),’ ‘water and cleansing agent other than soap (cleansing agents include locally available such as ash, mud or sand,’ ‘water only,’ ‘soap but no water (includes households with soap only as well as those soap and another cleansing agent),’ ‘cleansing agents other than soap only,’ and ‘ no water, soap or other cleansing agent.’ (National Population Commission & ICF International, 2014; Statistics Sierra Leone et al., 2014).

**Health workers (dentists, nurses, pharmacist & doctors/physicians):** refers to the amount of health workers available within the population. In this study, Liberia defined it as nurses, dentist, physician and pharmacists per 1,000 population (Liberia Institute of Statistics & Geo-Information Services, 2009). In Nigeria, it is defined as the number of doctors and dentists by state in the particular year (Kale, 2012). In Sierra Leone, it is defined as the distribution of clinical staff, nurse, physician and pharmacist by location (Statistics Sierra Leone, 2008).

**Knowledge:** a construct in the Integrated Behavioral Model; associated and needed for the intended behavior to be carried out (Montano & Kasprzyk, 2008).

**Integrated Behavioral Model:** a health behavior theory that uses the components of both the Theory of Planned Behavior and the Theory Reasoned Action and other
influential theories that further explains the intention to perform a certain behavior (Montano & Kasprzyk, 2008).

**Main source of drinking water:** the percent distribution of household population according to main source of drinking water (National Bureau of Statistics et al., 2013; UNICEF & Statistics Sierra Leone, 2011). In Liberia, it is defined as the distribution of households by main source of drinking water (Liberia Institute of Statistics and Geo-Information Services (LISGIS), 2009). The variable is divided into: piped into dwelling, piped outdoors (compound, yard or plot), public tap, protected spring, unprotected well and surface water (lake, river, dam or stream).

**Number of poor:** refers to the sum of people within the population that are below the poverty line. In this study, Liberia defined it as the distribution of poor population by county in 2008 (Ministry of Planning and Economic Affairs). In Nigeria, it is defined as the incidence of poverty (headcount ratio)-the proportion of the population for whom consumption falls below poverty line, in a given population (Ogbru, 2005). In Sierra Leone, it is defined as the total percentage of poverty by district (The World Bank: Poverty Reduction and Economic Management Unit & Statistics Sierra Leone, 2013).

**Outcome expectations:** a construct in the Social Cognitive Theory; it assesses the belief that several consequences might occur from the behavior the person chooses to perform (McAlister et al., 2008).

**Perceived severity:** a construct in the Protection Motivation Theory; it assesses the perception of seriousness of the threat (Boer & Seydel, 1996).
**Perceived vulnerability:** a construct in the Protection Motivation Theory; it assesses the perception of likelihood in contacting the communicated threat (Milne et al., 2000).

**Prevalence and treatment of fever:** among children under 5, the percentage who had a fever in the two weeks preceding the survey; and among children with fever, the percentage for who advice or treatment was sought from a health facility or provider, the percentage who took antimalarial drugs, and the percentage who received antibiotics as treatment, by background characteristics. The variable is divided into: ‘percentage with fever,’ ‘percentage for who advice/treatment was sought from a health facility/provider,’ ‘percentage who took antimalarial drugs’ and ‘percentage who took antibiotic drugs’ (Liberia Institute of Statistics and Geo-Information Services (LISGIS) et al., 2014; National Population Commission & ICF International, 2014; Statistics Sierra Leone et al., 2014).

**Probable cases of Ebola:** any suspected cases that has been evaluated by a clinician (World Health Organization, 2014).

**Problems in accessing health care:** the percentage of women between the age of 15-49 who reported that they have serious problems in accessing health care for themselves when they are sick, by type of problems, according to background characteristics. The variable is divided into: getting permission to go for treatment, getting money for treatment, distance to health facility and not wanting to go alone (Liberia Institute of Statistics and Geo-Information Services (LISGIS) et al., 2014; National Population Commission & ICF International, 2014; Statistics Sierra Leone et al., 2014).
**Protection motivation:** a mediating variable that results from both threat and coping appraisals which functions to arouse, sustain and direct protective health behavior within an individual (Boer & Seydel, 1996).

**Protection Motivation Theory:** a health behavior theory that proposes a social cognitive account of an individual’s motivation to protection themselves based on: the perceived severity of the threat, the perceived likelihood of threat occurrence, their efficacy to perform the recommended preventive behavior and the costs associated with the recommended preventive behavior (Milne et al., 2000).

**Response costs:** a construct in the Protection Motivation Theory; it assesses any costs such as monetary, personal, effort or time that is associated with performing the recommended preventive behavior (Floyd et al., 2000; Milne et al., 2000).

**Response efficacy:** a construct in the Protection Motivation Theory; it assesses the belief that the recommended coping response will be effective in reducing the individual’s threat (Milne et al., 2000).

**Self-efficacy:** a construct in the Protection Motivation Theory that was taken from the Social Learning Theory developed by Bandura and added in 1983 to the revised model; it assesses the individual’s perceived ability to perform the recommended coping response (Boer & Seydel, 1996; Milne et al., 2000).

**Suspected cases of Ebola:** any living or dead person that suffered from a sudden onset of high fever after having come in contact with a suspected, probable or confirmed Ebola case, a dead or sick animal (World Health Organization, 2014).

**Threat appraisal:** refers to evaluating the fear appeal of an individual’s perception on how threatened he or she feels (Milne et al., 2000).
**Total health expenditure:** refers to the amount of money made available towards health services. In this study, Liberia defined it as the annual total expenditure on any health-related items for members of the household, by background characteristics (Liberia Institute of Statistics and Geo-Information Services (LISGIS) et al., 2014). In Nigeria, it is defined as the percentage of money spend on health expenditure in each state (National Bureau of Statistics, 2012). In Sierra Leone, it is defined as the annual health care expenditure (Statistics Sierra Leone).

**Total health facilities:** refers to the amount of health facilities accessible to the population. In this study, Liberia defines it as the number of facilities per county in 2012 (Ministry of Health and Social Welfare). In Nigeria, it is defined as the number of health care facilities per 100,000 population by state (Kale, 2012). In Sierra Leone, it is defined as the primary indicator of outpatient service access but it does not provide the full picture since it does not take into account the size of facilities (Bangura, 2011).

**Total population size:** refers to the sum of a defined population. In this study, Liberia defined it as the total population on the night of the 20th/21st of March 2008. It was obtained by multiplying the recorded number of households and the estimated average household size derived from the plot census (UNICEF, 2010). In Sierra Leone, it is defined as the distribution of the total population by the region of residence in the given year (Bangura, 2011). No definition was provided for Nigeria.

**Types of sanitation facilities/disposal of human waste:** the percent distribution of household population according to the type of toilet facility used by the household
(National Bureau of Statistics et al., 2013; UNICEF & Statistics Sierra Leone, 2011). In Liberia, it is defined as the distribution of households by means of human waste disposal (Liberia Institute of Statistics and Geo-Information Services (LISGIS), 2009). The variable is divided into: open pit latrine (pit latrine without slab), closed pit latrine (pit with slab), bush (no facility) and other/bucket.

**Water and soap at place for hand washing:** the percentage of households where place for hand washing was observed and percent distribution of households by availability of water and soap at place for hand washing. The variable is divided into: percentage of households where place for hand washing was not observed and percent distribution of households where place for hand washing was observed. Percentage of households where place for hand washing was not observed variable is divided into not in dwelling/plot/yard, no permission and other reasons. The second sub-variable, percent distribution of households where place for hand washing was observed is divided into ‘water and soap are available,’ ‘water is available, soap is not available,’ ‘water is not available, soap is available,’ and ‘water and soap are not available.’ (National Bureau of Statistics et al., 2013; UNICEF & Statistics Sierra Leone, 2011).

**Wealth index:** indicates the level of concentration of wealth, with 0 being an equal distribution and 1 a totally unequal distribution (Liberia Institute of Statistics and Geo-Information Services (LISGIS) et al., 2014; Statistics Sierra Leone et al., 2014). In Nigeria, it is defined as the inequalities by state (Japan International Cooperation Agency (JICA) & Mitsubishi UFJ Research and Consulting Co. Ltd., 2011).
H. Delimitation

The generalizability for the study outlined in chapter 2 might be compromised because the data used for the study focuses on three countries from the West African region. Since the study is delimited to the West African region, it may not be generalizable to other part of the African continent. This is because each region in the continent is very different, due to their cultural, behavioral, social and environmental influences within the region and within each country. In addition, the investigated countries in the study are delimited to only three English-speaking countries that were infected with the Ebola virus. Thus, the analysis may not be valid for any French-speaking countries that were infected during the 2014 outbreak.

In addition, the behavioral, environmental, and social data included in this study are the latest information collected before the outbreak. Depending on the data source, the periods range from 2004 to 2013. This study is delimited to the availability of data and their timing of collection. The latest available behavioral, environmental and social data hypothesized as the best estimates prior to the 2014 Ebola virus outbreak.

The study outlined in chapter 3 is delimited to only emergency nurses that are members of the Emergency Nurses Association. The sample size was determined from the membership list and the sample may not be representative of all emergency nurses. In addition, generalizability of the study was affected because the study only focused on emergency nurses living in the United States, who can read and understand English.

I. Limitation

Due to the nature of the research study in chapter 2, the availability of data for certain variables for the countries is a potential limitation. For example, data on hand
washing and water and soap availability for Liberia is unavailable. Unlike Nigeria and Sierra Leone, Liberia does not collect information on observation of hand washing and the availability of soap and water within the household. Missing data such as those associated with hand washing presents a challenge because the study analyses were conducted with secondary data. Mean substitution or elimination of any of the districts within in each country was not an option due to the sample size. In addition, the variable correlations might be affected due to the reduction in variance (Tabachnick & Fidell, 2001).

Another study limitation relates to the interpretation of the results. The data used for the study was procured from multiple credible sources. Data regarding the Ebola virus outbreak was collected for each district within Liberia, Nigeria and Sierra Leone from their respective Ministry of Health offices. The possible determinants of transmission were collected from surveys conducted by each country’s Ministry of Health with the assistance of credible international agencies such as the World Bank, World Health Organization (WHO) and the United Nations. Due to the variation of assessments, reporting and the definitions for each variable vary across countries, which might affect the interpretation of the results.

Finally, ecological fallacy is another study limitation. The association determined within the study does not necessarily hold for every individual within the communities in each country.

For the study in chapter 3, the sample was obtained using the membership list from the Emergency Nurses Association. The association requires certain monetary fees to become a member, so it attracts nurses that have the financial resources to participate.
Due to this, the association does not include every emergency nurse in the United States. Therefore the study was not representative of all emergency nurses and might become a potential threat to external validity.

Another study limitation relates to the participant’s responses to the survey. Since the Ebola virus outbreak took place approximately one year before the survey was distributed, the timing of the event might influence the nurse’s protection motivation towards a possible patient with an Ebola infection and affect the internal validity of the findings. Also, non-respondents affected internal validity because these individuals could have responded differently than the respondents. Self-reported responses are another limitation that can affect the internal validity of the study.

Finally, participants are limited in the responses and information they can provide, potentially compromising the internal and external validity findings elicited from the survey.

J. **Summary**

This chapter described the extent in which the Ebola virus is transmitted and spread during past outbreaks and the 2014 outbreak throughout certain countries in the West African region and outside. A detailed background of the virus based on the literature is included, along with the gaps noted within Ebola virus research. The purpose of the studies, research questions and research hypotheses are stated. The chapter concludes with a discussion of the delimitations and limitations of each research study.
CHAPTER TWO

The Behavioral, Environmental and Social Correlates in the 2014 Ebola Haemorrhagic Fever Outbreak in West Africa

A. Introduction

Throughout the years, the Ebola virus has sporadically appeared around the world, which has led to the devastation of towns, villages and cities, especially in the African region. This deadly lethal virus first appeared in 1976, resulting in an epidemic in southern Sudan and northern Democratic Republic of Congo (formerly Zaire) simultaneously. During this initial outbreak, the disease claimed 150 of the 284 victims, which resulted in the mortality rate of 53% over a period of 5 months in Sudan. In the Democratic Republic of Congo, the disease killed 284 of the 318 infected, which led to a mortality rate of 89% over a period of 2 months (Pourrut et al., 2005).

Since its discovery, the Ebola virus has caused at least 14 outbreaks between 1976 and 2006 in Africa (Legrand et al., 2007). The 2014 outbreak started in Gueckedou, Guinea and spread to its neighboring countries of Liberia and Sierra Leone and other countries within the West African region (K.A. Alexander et al., 2014). This outbreak has been considered one of the worst, with approximately 3,685 probable, confirmed and suspected cases in the region, with Sierra Leone and Liberia having an estimated 2,914 cases and Guinea 771 cases in 2014 (Meltzer et al., 2014). In early 2016, the Centers for Disease Control and Prevention (CDC) reported a total of 28,603 confirmed, suspected and probable cases in Guinea (3,804), Liberia
(14,124) and Sierra Leone (10,675). From this total, 15,217 were laboratory confirmed cases and 11,301 deaths (Centers for Disease Control and Prevention, 2016).

Thus far, there is very little known about this highly contagious and deadly disease that claims between 50% and 90% of the infected (Legrand et al., 2007). However, researchers have made some progress in addressing certain aspects of understanding the disease. These include the biological and epidemiological features of the virus and the disease. These features include the subtypes of the virus, symptoms, incubation period, human-to-human transmission and a possible reservoir for the virus and animal-to-human transmission.

The Ebola virus is a highly transmissible disease caused by direct contact with any infected bodily fluids or animal carcasses. However, researchers are unsure of the reservoir of this virus. They have hypothesized that bats are the possible reservoir for the virus (European Centre for Disease Prevention and Control, 2014) because bats were discovered in multiple outbreaks that occurred worldwide (Pourrut et al., 2005).

Another gap in Ebola virus research is the rapid movement of the virus between human beings. Factors related to the rapid spread of the virus are relatively unknown. Socio-cultural factors contribute significantly to the spread of the disease, especially cultural practices within the region (Chowell & Nishiura, 2014; Hewlett & Amola, 2003). Researchers have provided limited information regarding how cultural practices such as burial practices, funerals, use of traditional healers and cures and the consumption of ‘bush meat’ has affected the rapid spread of the Ebola virus (K.A. Alexander et al., 2014; Hewlett & Amola, 2003; Jones, 2011).
Unfortunately, there also is very limited research on what behavioral, environmental and social factors affect the spread and transmission of the virus. This research study aims to bridge the gap by using three West African countries: Liberia, Nigeria and Sierra Leone, which were affected by the 2014 Ebola virus outbreak. The study addressed the behavioral, environmental and social factors associated with the mortality and morbidity during the outbreak as well as the significant predicting factors for this outbreak.

B. Methodology

a. Study Design

An ecological correlational study was conducted to investigate the behavioral, environmental and social factors associated with 2014 confirmed, probable and suspected cases of Ebola infection. Data regarding the Ebola virus outbreak was collected for each district within Liberia, Nigeria and Sierra Leone from each countries respective Ministry of Health’s daily outbreak report. The possible determinants of transmission were collected from surveys conducted by each countries Ministry of Health with assistance from credible international agencies such as the World Banks and the United Nations. The latest available information for the determinants from each country was used for the study.

b. Variables and Measures

The progression and definition of the disease within the region is divided into confirmed Ebola cases, probable Ebola cases and suspected Ebola cases. Confirmed cases are any suspected or probable cases that resulted in a
positive laboratory test for the Ebola virus. Probable cases are any suspected cases that were evaluated by a clinician. Suspected cases are defined as any living or dead person that suffered from a sudden onset of high fever after having come in contact with a suspected, probable or confirmed Ebola virus case, a dead or sick animal (World Health Organization, 2014).

The possible determinants are divided and defined as behavioral, environmental and social factors that could be associated with the spread of Ebola virus. Refer to appendix C for the definition and sources of the possible determinants. Behavioral factors are personal or community behavior that could increase the spread or transmission of the Ebola virus. Within this study, the behavioral factors are from 2013 and include the observation and method of hand washing within the household (National Population Commission & ICF International, 2014; Statistics Sierra Leone et al., 2014), past or latest sexual intercourse that occurred in women and men between the age of 15 and 49, type of disposal for children’s stools, type of mass media women and men were exposed to and the employment status for both men and women (Liberia Institute of Statistics and Geo-Information Services (LISGIS) et al., 2014; National Population Commission & ICF International, 2014; Statistics Sierra Leone et al., 2014).

The next possible determinants are environmental factors, which involve the physical existence and influences within the community. For this study, these include the availability of water and soap at the place for hand washing, the availability of soap within the dwelling (National Bureau of

The last possible determinants are social factors, which involves external influences and lifestyle that could be responsible for the spread and transmission of the Ebola virus. In this study, these include the treatment of fever for children under the age of 5 (Liberia Institute of Statistics and Geo-Information Services (LISGIS) et al., 2014; National Population Commission
Each possible determinant used in this study was standardized for data analysis. Burial practices before and after the 2014 Ebola virus outbreak and the use of traditional healers to cure the Ebola virus are possible determinants for the spread of the infection. Unfortunately, data is not available for these variables.

c. **Statistical Analysis**

Descriptive statistics, Spearman Rho Correlation and Stepwise Linear Regression was conducted with the variables using Statistical Packages for Social Sciences (SPSS). Descriptive statistics such as mean, minimum, maximum and standard deviation was conducted for the significant possible determinants, Ebola mortality and Ebola morbidity.

Spearman Rho Correlation was conducted to determine whether there were positive, negative or no bivariate correlations between the variables. Next, a Stepwise Linear Regression was done in an attempt to model the relationship between the variables and fit a linear equation to the observed data. In this case, the explanatory variables were the behavioral, environmental and social factors and the outcome variables were confirmed, probable and suspected Ebola virus cases and deaths.

C. **Results**

Statistical analyses for each research question outlined in chapter 1 are presented in this section. This includes: descriptive statistics, correlation and meaningful predicting variables associated with the significant outcome variables.

a. **Variable Characteristics**
The mean, standard deviation, minimum, maximum and sample size for each significant dependent variable and their possible determinants are provided in Table 2.1.

The results in the table documents that, in each district on average, there were 63 (SD 141.4) initial confirmed Ebola cases and 31 (SD 114.3) initial suspected cases reported at the beginning of the outbreak. During this period, there were a maximum of 545 confirmed cases and 864 suspected cases in one day. Total deaths at the beginning of the outbreak had an average of 15 (SD 46.5) probable deaths and a maximum of 268 reported probable deaths in one day. Deaths reported towards the end of 2014 had an average of 65 (SD 213.1) confirmed deaths and a maximum of 1,598 confirmed deaths reported in Montserrado, Liberia on November 21st, 2014.

The significant predictors for the outcome variables are divided into behavioral, environmental and social factors. Behavioral factors include (1) the employment status for females was reported as approximately 3% (SD 3.7%) being unemployed; (2) Recent sexual activity among females was approximately 11% (SD 6.3%) for women who never had sexual intercourse. For men, an average of 5% (SD 3.7%) reported having sexual intercourse within one or more years; (3) Disposal of a child’s stool was reported as 51% (SD 24.4%) disposed safely, 3% (SD 4.8%) buried and 12% (SD 13.7%) left in the open. A maximum of 50% of a children’s stool was left in the open in Lofa, Liberia in 2013.
**Environmental factors** include (1) the distribution of each district’s main source of drinking water reported that approximately 8% (SD 12.9%) piped their water from a compound, yard or plot and 24% (SD 20.1%) used lakes, rivers, dams or streams. A maximum of 83% of drinking water provided in Rivercess, Liberia in 2008 were from lakes, rivers, dams or streams. (2) The availability of soap for hand washing was reported as 0.5% (SD 1%) unobserved or not shown. (3) The distribution of sanitation facilities was reported as approximately 30% (SD 53%) were pit latrines with a slab. (4) On average 11% (SD 9.7%) of women reported needing permission before going for treatment and 18% (SD 12.1%) did not want to go to the health facility alone. In 2013, a maximum of 49% of women in Kono, Sierra Leone stated that they needed permission before going for treatment and 51% of women in Rivercess, Liberia cited not wanting to go alone as a problem. (5) On average 4% (SD 4%) of households did not give permission to observe hand washing and 10% (SD 11%) had water available but no soap in their home. (6) The average money allocated annually for health (health expenditure) was 4% (SD 6.5%), with a maximum of 40% of money in Kono, Sierra Leone was allocated to health care.

**Social factors** include (1) the distribution of male by their highest level of education (male educational attainment) reported that on average 26% (SD 9.5%) had some type of secondary education and 12% (SD 12.1%) had some primary education. In 2013, there was a maximum of 49% of men with some secondary education and 51% with some primary education. (2) The
prevalence and treatment of fever for a child under the age of 5 reported had approximately 48% (SD 18.1%) treated in a health facility or by a provider and 30% (SD 13%) took antibiotic drugs. (3) Literacy rates among females reported that on average 9% (SD 3.3%) could read part of a sentence.

b. Statistical Analysis

Spearman Rho Correlation and Stepwise Linear Regression display the outcome variables that indicated meaningful significant predicting variables. Initial confirmed cases include (1) Women who were unemployed ($\rho= .5$, $p<.01$), men with some secondary education ($\rho= .5$, $p<.01$) and children under the age of 5 who took antibiotic drugs to treat fever ($\rho= .4$, $p<.01$) were highly and positively correlated to Ebola cases at the beginning of the outbreak. (2) Women who can read part of a sentence ($\rho= -.1$) and men who had sexual intercourse within one or more years ($\rho= -.2$) were negatively correlated with Ebola cases at the beginning of the outbreak as shown in the correlation matrix in Table 2.2.

Based on the Stepwise Linear Regression presented in Table 2.3, women who were unemployed ($\beta= .4$, $t= -3.9$, $p<.01$), women who could read part of a sentence ($\beta= -.4$, $t= -3.9$, $p<.01$), men who attained some secondary education ($\beta= -.6$, $t= -4.3$, $p<.01$), men who had sexual intercourse one or more years ($\beta= .4$, $t= -3.1$, $p<.01$) and children under the age of 5 who took antibiotic drugs to treat fever ($\beta= -.3$, $t= -2.2$, $p<.05$) are significant predictors for initial confirmed Ebola cases. The regression shows that higher female unemployment rates, high sexual activity among men, low literacy and
educational rates among women and men and fewer children who take antibiotic drugs for treating fever are significantly associated with confirmed Ebola cases reported at the beginning of the outbreak. In sum, 65% of the variance (adjusted $R^2$) in predicting initial confirmed cases can be explained by these variables.

**Initial suspected cases** include (1) Men with some secondary education ($\rho=.5, p<.01$), households that rely on lakes, rivers, dams or streams as their main source of drinking water ($\rho=.3, p<.05$), money given to each district for healthcare ($\rho=.6, p<.01$) and leaving a child’s stool out in the open ($\rho=.3, p<.05$) were highly and positively correlated. (2) Women who reported needing permission to seek healthcare services ($\rho=.1$) were positively correlated to suspected Ebola cases reported at the beginning of the outbreak.

In Table 2.3, total money provided for healthcare ($\beta=.6, t=6.6, p<.01$), women needing permission to seek healthcare ($\beta=.4, t=4.1, p<.01$), main source of drinking water obtained from lakes, rivers, dams or streams ($\beta=.3, t=3.1, p<.01$), leaving a child’s stool out in the open ($\beta=-.3, t=-2.9, p<.01$) and men with some secondary education ($\beta=.2, t=2.2, p<.05$) are a significant predictors for initial suspected Ebola cases. In sum, 73% of the variance (adjusted $R^2$) in predicting these cases can be explained by these variables.

**Latest confirmed deaths** include (1) Men with some secondary education ($\rho=.6, p<.01$), households that obtain their main source of drinking water from their compound, yard or plot ($\rho=.4, p<.01$), children under the age of 5 who sought out fever treatment at a health facility ($\rho=.7, p<.01$) and
households that rely on lakes, rivers, dams or streams as their main source of drinking water \( (p=.3, \ p<.05) \) were highly and positively correlated. (2) Households that refused to show their availability of soap at their place of hand washing \( (p=.1) \) were positively correlated to confirmed Ebola deaths reported towards the end of the outbreak. (3) Women who never had sexual intercourse \( (p=-.6, \ p<.01) \) and households that refused permission to see whether there was water and soap available for hand washing \( (p=-.3, \ p<.05) \) were highly and negatively correlated as shown in the correlation matrix provided in Table 2.2.

Children under the age of 5 who were treated for fever in a health facility or by a provider \( (\beta=.3, \ t=3.2, \ p<.01) \), main source of drinking water piped from their compound, yard or plot \( (\beta=.3, \ t=3.0, \ p<.01) \) or obtained from lakes, rivers, dams or streams \( (\beta=-.3, \ t=-2.7, \ p<.05) \), women who never had sexual intercourse \( (\beta=-.7, \ t=-5.7, \ p<.01) \), households that refused permission to see whether there was water and soap available for hand washing \( (\beta=.3, \ t=3.4, \ p<.01) \), men with some secondary education \( (\beta=.6, \ t=5.7, \ p<.01) \) and households that refused to show their availability of soap at their place of hand washing \( (\beta=-.2, \ t=-2.3, \ p<.05) \) were outlined in Table 2.3 as significant predictors for confirmed Ebola deaths that occurred towards the end of the outbreak. In sum, 74% of the variance \( (\text{adjusted } R^2) \) in predicting these latest confirmed deaths can be explained by these variables.

**Initial probable deaths** include (1) Women who were unemployed \( (p=.4, \ p<.01) \), women who reported not wanting to go alone for healthcare
(ρ=.4, p<.01), burying a child’s stool (ρ=.3, p<.05) and men who received some primary education (ρ=.6, p<.01) were highly and positively correlated. (2) Households that refused to show their availability of soap at their place of hand washing (ρ=-.1) and safely disposing a child’s stool (ρ=-.1) were negatively correlated. (3) Households with pit latrine with slab as a type of sanitation facility (ρ=.2), women who reported needing permission to seek healthcare services (ρ=.1) and households with water but no soap available for hand washing (ρ=.1) were positively correlated to probable deaths reported at the beginning of the outbreak.

Based on the results in Table 2.3, households that use pit latrine with as slab as their sanitation facility (β=.2, t=2.8, p<.05), women needing permission to seek healthcare (β=.6, t=10.7, p<.01), women not wanting to go alone for healthcare (β=-.2, t=-4.0, p<.01), female unemployment (β=.4, t=9.2, p<.01), households that refused to show their availability of soap at their place of hand washing (β=.6, t=7.0, p<.01), safely disposing (β=-.3, t=-6.0, p<.01) and burying (β=-.1, t=-3.4, p<.01) a child’s stool, men with some primary education (β=-.1, t=-2.7, p<.05) and households with water but no soap available for hand washing (β=.1, t=2.3, p<.05) were significant predictors for possible Ebola deaths reported in the beginning of the outbreak. In sum, 96% of the variance (adjusted R²) in predicting these initial probable deaths can be explained by these variables.

D. Discussion
Due to the sporadic occurrence of the Ebola virus, there have been limited studies that focus on health behavior factors associated with the transmission of the virus. The purpose of the study was to exam the relationship between Ebola virus morbidity and mortality and possible determinants (behavioral, environmental and social factors), which might prevent future transmission of the disease, thus saving countless lives. The results revealed there an association between four outcome variables and behavioral, environmental and social factors. The outcome variables, Ebola morbidity (initial confirmed cases and initial suspected cases) and Ebola mortality (initial probable deaths and latest confirmed deaths) provided information concerning how behavioral, environmental and social factors influence the transmission of the Ebola virus.

Health behavior factors and especially environmental factors were significant in each of these outcome variables and are largely associated with the transmission and death from an Ebola infection. Such environmental factors including the availability of water and soap for hand washing, access to healthcare, total health expenditure and type of sanitation facilities could have contributed to this outbreak based on the study findings. These factors strongly shape the differences between what human beings do and how they interact with their environment (Kathleen A. Alexander & McNutt, 2010).

According to the World Health Organization (WHO), regular hand washing with soap and water, good hand hygiene or hand washing and a clean environment are needed to reduce the transmission of the disease throughout a community (World Health Organization, 2016). The practice of good hand
hygiene is the basic level of patient safety and protection against an Ebola infection. However, lack of hand washing in most places was due to limited education and a damaged health infrastructure within the infected countries. According to the WHO, road systems, transportation and telecommunications are weak especially in the rural areas of the infected countries. Fragile health systems led to a delay in transporting patients to treatment centers and laboratories, reporting the spread of the disease and public information campaigns on preventive practices for an Ebola infection (World Health Organization, 2015).

Access to healthcare is another factor that demonstrates the crumbling health infrastructure due to lack of adequate supplies and insufficient training within African countries with high prevalence rates for the Ebola virus (Jones, 2011). Health expenditure contributes to access to healthcare because the government health expenditure are low but the private expenditure are high due to direct out-of-pocket payments. Additionally, most of the money the government provides is allocated to common diseases such as HIV, malaria and tuberculosis that have very high prevalence rates within these countries. Due to this, there was limited aid available for Ebola infection control (Kieny, Evans, Schmets, & Kadandale, 2014).

Another factor is the type of sanitation facility, which contributes to the transmission of the disease due to the exposure to infected bodily fluids through direct contact or by touching fomites. WHO indicated that standard precautions relating to pit latrines should be taken to prevent contaminating the environment with faeces and urine (World Health Organization & UNICEF, 2014). Similarly,
social factors (education and the treatment of fever) and behavioral factors (employment status, sexual activity and disposal of children’s waste) are connected with environmental factors and that can contribute to the transmission and death by an Ebola infection as the results of this study demonstrate. Limited education and training about the disease, its signs and symptoms and transmission method of disease affect the increasing morbidity and mortality rates of the Ebola infection. Fear is considered as a huge obstruct of health intervention due to limited education among the community members. Researchers determined that in past outbreaks, health education was a major factor in decreasing the effective reproductive rate and transmission of the Ebola virus. The use of health messages that target the culture and traditions within the communities is very important to reduce the prevalence of the disease (K.A. Alexander et al., 2014).

Another factor, unemployment rates is linked to poverty within the community. This makes access to healthcare very difficult due to the cost associated with quality care. Both behavioral and social factors were not found to be largely responsible in determining the transmission of the virus. This finding is consistent with one research study that examined the factors that lead to the emergence of the 2014 outbreak. The researchers determined that the interaction with wildlife, poor health infrastructure, social infrastructure, behavioral and cultural practices led to an increase of disease transmission (K.A. Alexander et al., 2014).

E. Limitation
Several inherent limitations exist when using a secondary data set to conduct an ecological analysis. First of all, reporting and definitions for each variable vary within each country, which might affect the interpretation of the results. Moreover, the access and reporting of data varied depending on the country and the variable of interest, thus representing an internal validity threat. Mean substitution or elimination of any of the districts within in each country was not an option due to the sample size. In addition, the variable correlations might be affected due to the reduction in variance (Tabachnick & Fidell, 2001). Finally, ecological fallacy is another study limitation. The association determined within the study does not necessarily hold for every individual within the communities in each country. Careful interpretation of the results is suggested, since this is a relatively new examination of health behavior factors that could be associated with the transmission of the Ebola virus.

F. Recommendation

This study identified that there are significant association between Ebola virus morbidity/mortality and health behavior/environmental factors. Thus, countries that have high prevalence and incidence for this disease should be aware and address the health behavior and environmental factors that contribute to the transmission of the disease.

Officials within these countries should make provisions that could assist with future Ebola virus outbreaks. Based on the study findings, factors relating to accessing healthcare, preventive equipment and methods such as hand hygiene should be addressed within these communities. Standard operation processes
should be developed within these countries as well as having adequate training on the preventive and protective methods for health care workers. In past outbreaks health care workers had some of the highest mortality rates due to rapid exposure to the disease and limited protective equipment and training. Additionally, an increase in government health expenditure within these communities could increase the availability of accommodations and protective equipment against this disease. Becoming aware and addressing, these health behavior factors could reduce the mortality rate of the Ebola virus.

G. Conclusion

The study determined that health behavior and environmental factors contribute immensely to the transmission of the Ebola virus. Since there are very limited studies that examine the health behavior, environmental, and social factors that affect the transmission of the disease, future research studies in this area are suggested. These studies should include additional possible determinants that focus on cultural and behavioral factors. Researchers have hypothesized that possible cultural factors such as burial practices and the use of traditional healers contribute to the transmission of the Ebola virus (K.A. Alexander et al., 2014). Additionally, conducting a similar study that focuses on other regions that have had Ebola virus outbreaks is suggested. A comparison of these health behavior, environmental, and social factors between these regions might lead to an understanding of which factors are most common and should be addressed, which might guide practices that result in decreasing the transmission of the virus.
Additional problems such as economy, public health, social and political infrastructure might be contributing factors that hinder these countries from training healthcare professionals, providing the necessary equipment and accommodations and investigating the health behavior factors. To an extent, these countries might be willing to determine these health behavior factors since it could lead to a reduction in mortality rates for the Ebola virus.
Table 2.1: Descriptive Statistics of Outcome Variables and Related Determinants

<table>
<thead>
<tr>
<th>Outcome Variable</th>
<th>N</th>
<th>Min.</th>
<th>Max.</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial confirmed cases</td>
<td>66</td>
<td>0</td>
<td>545</td>
<td>63.5</td>
<td>141.44</td>
</tr>
<tr>
<td>Initial suspected cases</td>
<td>66</td>
<td>0</td>
<td>864</td>
<td>31.0</td>
<td>114.32</td>
</tr>
<tr>
<td>Initial probable deaths</td>
<td>66</td>
<td>0</td>
<td>268</td>
<td>14.7</td>
<td>46.54</td>
</tr>
<tr>
<td>Latest confirmed deaths</td>
<td>66</td>
<td>0</td>
<td>1598</td>
<td>65.2</td>
<td>213.09</td>
</tr>
<tr>
<td>Female currently unemployed (%) in 2013</td>
<td>66</td>
<td>.10</td>
<td>20</td>
<td>2.8</td>
<td>3.71</td>
</tr>
<tr>
<td>Male with some secondary education (%) in 2013</td>
<td>66</td>
<td>3</td>
<td>49</td>
<td>26.3</td>
<td>9.50</td>
</tr>
<tr>
<td>Main source of drinking water (% of water from a compound, yard or plot)</td>
<td>66</td>
<td>0</td>
<td>45</td>
<td>8.1</td>
<td>12.89</td>
</tr>
<tr>
<td>Prevalence &amp; treatment of fever for children under age 5 (% who sought treatment from a health facility/provider) in 2013</td>
<td>63</td>
<td>12</td>
<td>84</td>
<td>47.7</td>
<td>18.09</td>
</tr>
<tr>
<td>Availability of soap (% of places where hand washing was not observed and soap was not shown) in 2013</td>
<td>51</td>
<td>0</td>
<td>7</td>
<td>.5</td>
<td>1.04</td>
</tr>
<tr>
<td>Type of sanitation facilities (% of pit latrines with a slab)</td>
<td>66</td>
<td>.9</td>
<td>442</td>
<td>30.3</td>
<td>53.3</td>
</tr>
<tr>
<td>Problems accessing healthcare (getting permission to go for treatment)</td>
<td>66</td>
<td>.5</td>
<td>49</td>
<td>11.3</td>
<td>9.66</td>
</tr>
<tr>
<td>Female recent sexual activity (% that never had sexual intercourse)</td>
<td>66</td>
<td>.3</td>
<td>26</td>
<td>11.1</td>
<td>6.33</td>
</tr>
<tr>
<td>Water and soap available for hand washing (% of households where hand washing was not observed) in 2013</td>
<td>51</td>
<td>0</td>
<td>20</td>
<td>3.8</td>
<td>4.04</td>
</tr>
<tr>
<td>Main source of drinking water (% of water from lakes, rivers, dam or streams)</td>
<td>66</td>
<td>0</td>
<td>83</td>
<td>24.3</td>
<td>20.10</td>
</tr>
<tr>
<td>Disposal of children’s stools (% disposed safely)</td>
<td>66</td>
<td>6</td>
<td>93</td>
<td>51.0</td>
<td>24.36</td>
</tr>
<tr>
<td>Problems accessing healthcare (not wanting to go alone)</td>
<td>66</td>
<td>.2</td>
<td>51</td>
<td>18.5</td>
<td>12.05</td>
</tr>
<tr>
<td>Disposal of children’s stool (% buried)</td>
<td>66</td>
<td>0</td>
<td>22</td>
<td>3.1</td>
<td>4.85</td>
</tr>
<tr>
<td>Male with some primary education (%) in 2013</td>
<td>66</td>
<td>.4</td>
<td>51</td>
<td>12.0</td>
<td>12.12</td>
</tr>
<tr>
<td>Water and soap for hand washing (% of households with water available but soap unavailable) in 2013</td>
<td>51</td>
<td>0</td>
<td>55</td>
<td>10.2</td>
<td>10.75</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>-----------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Female literacy (% who can read part of a sentence) in 2013</td>
<td>66</td>
<td>0</td>
<td>16</td>
<td>6.9</td>
<td>3.29</td>
</tr>
<tr>
<td>Male recent sexual activity (% reported having sexual intercourse one or more years) in 2013</td>
<td>66</td>
<td>.10</td>
<td>18</td>
<td>5.3</td>
<td>3.70</td>
</tr>
<tr>
<td>Prevalence &amp; treatment of fever for children under age 5 (% who took antibiotic) in 2013</td>
<td>62</td>
<td>2</td>
<td>62</td>
<td>30.3</td>
<td>12.99</td>
</tr>
<tr>
<td>Total health expenditure (%)</td>
<td>66</td>
<td>0</td>
<td>40</td>
<td>3.9</td>
<td>6.45</td>
</tr>
<tr>
<td>Disposal of children’s stool (% left in the open)</td>
<td>66</td>
<td>0</td>
<td>50</td>
<td>12.1</td>
<td>13.74</td>
</tr>
<tr>
<td></td>
<td>OV1</td>
<td>OV2</td>
<td>EX1</td>
<td>EX2</td>
<td>EX3</td>
</tr>
<tr>
<td>-----</td>
<td>------</td>
<td>------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>OV1</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OV2</td>
<td></td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EX1</td>
<td>.50**</td>
<td>.95**</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EX2</td>
<td>.50**</td>
<td></td>
<td>.25*</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>EX3</td>
<td>.25*</td>
<td>.38**</td>
<td>-.12</td>
<td>.29*</td>
<td>1.00</td>
</tr>
<tr>
<td>EX4</td>
<td>.72**</td>
<td>.73**</td>
<td>.35**</td>
<td>.45**</td>
<td>.18</td>
</tr>
<tr>
<td>EX5</td>
<td>.03</td>
<td>.07</td>
<td>-.30*</td>
<td>.00</td>
<td>.25</td>
</tr>
<tr>
<td>EX8</td>
<td>-.58**</td>
<td>-.62**</td>
<td>-.48**</td>
<td>-.18</td>
<td>-.25*</td>
</tr>
<tr>
<td>EX9</td>
<td>-.33*</td>
<td>-.30*</td>
<td>-.27</td>
<td>-.19</td>
<td>.06</td>
</tr>
<tr>
<td>EX10</td>
<td>.26*</td>
<td>.27*</td>
<td>.24</td>
<td>.18</td>
<td>.43**</td>
</tr>
<tr>
<td>EX16</td>
<td>-.10</td>
<td>-.02</td>
<td>-.10</td>
<td>.39**</td>
<td>.29*</td>
</tr>
<tr>
<td>EX17</td>
<td>-.24</td>
<td>-.26*</td>
<td>-.12</td>
<td>.13</td>
<td>-.37</td>
</tr>
<tr>
<td>EX18</td>
<td>.39**</td>
<td>.47**</td>
<td>.23</td>
<td>.38**</td>
<td>.18</td>
</tr>
</tbody>
</table>

**Note:** (OV1): Outcome variable-Initial confirmed cases, (OV2): Outcome variable-Latest confirmed deaths, (EX1): Female unemployment, (EX2): Males with some education, (EX3): Main source of drinking water (% piped outdoors-compound, yard or plots), (EX4): Prevalence & treatment of fever for children under age 5 (% who sought treatment from a health facility/provider), (EX5): Availability of soap (% of places where hand washing was not observed and soap was not shown), (EX8): Female recent sexual activity (% that never had sexual intercourse), (EX9): Water and soap available for hand washing (% of households where hand washing was not observed) in 2013, (EX10): Main source of drinking water (% of water from lakes, rivers, dam or streams), (EX16): Female literacy (% who can read part of a sentence) in 2013, (EX17): Male recent sexual activity (% reported having sexual intercourse one or more years) in 2013, (EX18): Prevalence & treatment of fever for children under age 5 (% who took antibiotic) in 2013.

**p<0.01; *p<0.05**
### Table 2.3: Stepwise Linear Regression with Significant Outcome Variables and Related Determinants

|   | EX1 | EX2 | EX3 | EX4 | EX5 | EX6 | EX7 | EX8 | EX9 | EX10 | EX11 | EX12 | EX13 | EX14 | EX15 | EX16 | EX17 | EX18 | EX19 | EX20 | R² | Adj-R² |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|-----|------|
| OV1 | .44** | .59** |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      | .45** | .39** | -.26* | .70 | .65 |
| OV3 |     |     | .21* |     |     | 39** |     |     | .29** |      |      |      |      |      |      |      |      |      |      | .63** | .27** | -.77 | .74 | .73 |
| OV2 |     |     |     | .63** | .30* | .33** | -.23* |     |     | .70** | .34** | -.32* |      |      |      |      |      |      |      |      |      | .79 | .74 |
| OV4 |     |     |     |     | .62** | .23* | .61** |     |     |      | .27** | .22** | .14** | -.12* | .01* |      |      |      |      |      |      | .97 | .96 |

**Note:** (OV1): Outcome variable-Initial confirmed cases, (OV2): Outcome variable-Latest confirmed deaths, (OV3): Outcome variable-Initial suspected cases, (OV4): Outcome variable-Initial probable deaths, (EX1): Female unemployment, (EX2): Males with some education, (EX3): Main source of drinking water (% piped outdoors-compound, yard or plots), (EX4): Prevalence & treatment of fever for children under age 5 (% who sought treatment from a health facility/provider), (EX5): Availability of soap (% of places where hand washing was not observed and soap was not shown), (EX6): Type of sanitation facilities (% of pit latrines with a slab), (EX7): Problems accessing healthcare (getting permission to go for treatment), (EX8): Female recent sexual activity (% that never had sexual intercourse), (EX9): Water and soap available for hand washing (% of households where hand washing was not observed) in 2013, (EX10): Main source of drinking water (% of water from lakes, rivers, dam or streams), (EX11): Disposal of children’s stools (% disposed safely), (EX12): Problems accessing healthcare (not wanting to go alone), (EX13): Disposal of children’s stool (% buried), (EX14): Male with some primary education (%) in 2013, (EX15): Water and soap for hand washing (% of households with water available but soap unavailable) in 2013, (EX16): Male recent sexual activity (% reported having sexual intercourse one or more years) in 2013, (EX17): Male with some primary education in 2013, (EX18): Prevalence & treatment of fever for children under age 5 (% who took antibiotic) in 2013, (EX19): Total health expenditure (%), (EX20): Disposal of children’s stool (% left in the open).

**p<0.01; *p<0.05**
CHAPTER THREE

United States Emergency Nurses’ Motivation to Protect

Themselves against Ebola Infection

A. Introduction

Since the discovery of the Ebola virus, it has caused at least 14 outbreaks around the world between 1976 and 2006 devastating towns, villages and cities, especially in the Africa region (Legrand et al., 2007; Pourrut et al., 2005). This deadly lethal virus resulted in a mortality rate of 53% over a period of 5 months in Sudan and 89% mortality rate over a period of 2 months in the Democratic Republic of Congo during its initial outbreak in 1976 (Pourrut et al., 2005).

Thus far, there is very little known about this highly contagious and deadly disease that claims between 50% and 90% of the infected (Legrand et al., 2007). The 2014 outbreak began in Gueckedou, Guinea and spread to its neighboring countries of Liberia, Sierra Leone and other countries within the West African region (K.A. Alexander et al., 2014). Due to this outbreak, countries outside of the African region such as the United States were unexpectedly affected either by possible patients with an Ebola infection entering the country or were transferred to the country for advance medical care.

The sporadic occurrence of this virus has resulted in limited research on the care of possible patients with an Ebola infection within countries such as the United States, since the country has had a very low prevalence rate during past outbreaks
(Centers for Disease Control and Prevention, 2010). Additionally, there is insufficient research concerning healthcare professionals and how they treat possible patients with an Ebola infection they might encounter at work. In most healthcare settings, the emergency room is the first point of entry and the nurses have an increased risk of exposure to the virus.

The purpose of the research study is to use a modified Protection Motivation Theory (PMT) to explore the United States emergency nurses’ motivation to protect themselves against possible patients with an Ebola infection they might have encountered at work and its predictors. The study aimed to examine the nurses’ protection motivation and determine their apprehension to give care to a possible patient who may have an Ebola infection. PMT focuses on the cognitive meditational processes, which involves the maladaptive and adaptive responses. Both responses can be processed as the threat appraisal and coping appraisal (Rippetoe & Rogers, 1987).

Protection motivation is a mediating variable that functions to arouse, sustain and direct protective health behavior within individuals. This variable is similar to the intention to perform a behavior and has a positive and negative linear function. This includes whether the threat was severe (perceived severity), the individual’s personal threat vulnerability (perceived vulnerability), effective recommended response (response efficacy) and the confidence an individual has in their ability to perform the recommended response (self-efficacy). The negative linear function is the cost of conducting the recommended response (response cost) (Boer & Seydel, 1996).
The constructs *perceived vulnerability* and *perceived severity* are part of the threat appraisal, which results in *fear*. This is because the more an individual feels vulnerable and takes the threat seriously there fear increases and the greater the appraised threat (Milne et al., 2000). The constructs used for this study, i.e. *perceived vulnerability, perceived severity, response cost, self-efficacy, response efficacy, and fear*, investigated a social cognitive account of protective behavior in an attempt to provide clarity on the area of fear appeals (Floyd et al., 2000; Milne et al., 2000). It explains attitude and behavior change through matching cognitive processes people use to evaluate threats and select coping alternatives (Floyd et al., 2000; Milne et al., 2000).

To enhance the study, two additional constructs i.e. *knowledge* and *outcome expectation*, were included to strengthen the predictability. *Knowledge* construct is found in other health behavior theories such as the Integrated Behavioral Model (IBM). Within IBM, intention to perform a behavior is considered the most important determinant of a behavior, however *knowledge* is needed to carry out the behavior (Montano & Kasprzyk, 2008). In this study, *protection motivation* is the outcome variable and *knowledge* acquired could protect emergency nurses if they encounter possible patients with an Ebola infection at work.

The construct *outcome expectation* is found in the Social Cognitive Theory. Within this theory, the expected outcome is the belief that multiple consequences might result from the behaviors a person chooses to perform (McAlister et al., 2008). *Outcome expectation* affects the lifestyle choices of an individual and contributes to their health behavior. The expectations can serve as an incentive (physical pleasures)
or as a disincentive (physical discomfort or pain) (Bandura, 1998). The construct has been effective in addressing studies that focused on health behavior changes such as condom use and tobacco use (McAlister et al., 2008). In this study, *outcome expectations* are maladaptive responses that examine the emergency nurse’s belief that not performing a particular behavior might lead to certain consequences.

PMT has been used in multiple research studies that focused on health promotion, disease prevention and injury prevention (Floyd et al., 2000). For example, studies that have used this theory as a framework for health education interventions were designed to influence health behavior changes such as alcohol reduction, healthy lifestyle enhancement, enhancing diagnostic health behaviors and disease prevention. Furthermore, the theory relates to disease prevention that addresses the predictive components with respect to the disease (Boer & Seydel, 1996). In this research study, the emergency nurses’ *protection motivation* against Ebola infection is investigated.

**B. Methodology**

a. **Study Design**

Based on Johnson’s (2001) classification of non-experimental quantitative research, this study used a descriptive cross-sectional research design. There was no manipulation of the study variables but only an examination of emergency nurses’ motivation to protect themselves when giving care to a possible patient with an Ebola infection during a single point in time (Johnson, 2001).

b. **Participant Selection**
The population of this research was emergency nurses. These are individuals that are nurses working in the emergency room in the United States in either an administrative or non-administrative position. Participants were selected from the Emergency Nurses Association (ENA) membership list.

A power analysis using G*Power was conducted to determine the appropriate sample size. Based on the analysis an estimated sample size of 436 is required to achieve generalizability towards the study population. This sample size was based on a linear multiple regression two-tailed t-test, a projected power of 0.95, type I error of 0.05 and an effect size of 0.03, which is conservative. Since this is a relatively new study it is better to start out with a conservative effect size to determine the relationships between the study variables. The effect size is interpreted using the set of descriptors proposed by Cohen (Kotrlik, Williams, & Jabor, 2011). There is a possibility of non-responders, therefore more than 436 emergency nurses were randomly selected using simple random sampling technique.

Upon achieving permission from ENA research department and the University of Toledo Institutional Review Board, a randomized mailing list of emergency nurses within the United States was purchased from Infocus Marketing. Members’ email addresses and phone numbers were not available for purchase.

c. Instrument Development
Since this a relatively new research topic, a focus group was conducted including emergency nurses working at the University of Toledo Medical Center (UTMC). Focus group discussions allowed the researchers to gather primary qualitative data from the priority population (Krueger & Casey, 2009). A focus group guide was used to collect additional opinions to refine the survey to the intended population. Ten nurses were included in the group and given a copy of the Adult Research Subject Information Sheet (refer to appendix D for a copy of the document and appendix E for a copy of the IRB approval letter). A draft of the research survey was given to participants to provide their written feedback about the survey questions.

Based on the focus group, the survey questions were modified to remove or include additional questions (refer to appendix F for a copy of the focus group summary). The instrument was an online questionnaire that was developed using Qualtrics with the assistance of the Office of Institutional Research at the University of Toledo. The questionnaire had 8 sections with 5-point one-directional response scale sections and knowledge-based questions. The last sections entailed demographic questions that include gender, age, race, level of education, current training level, current job position, years of practice, years at their current position and job location. Each survey items were specifically designed to assess the emergency nurses’: (1) protection motivation, (2) perceived severity, (3) perceived vulnerability, (4) fear, (5) outcome expectations, (6) response efficacy, (7) self-efficacy and (8) response cost. In addition, the knowledge construct was included to determine the
emergency nurses’ level of comprehension of the Ebola virus (Refer to appendix G for a copy of the survey instrument).

d. Instrument Testing

Face, content and construct validities were examined. Face validity was established through a comprehensive literature review on previous studies that have used PMT to survey respondents about infectious diseases. In addition, the focus group also addressed the face validity of the instrument (Cook & Beckman, 2006; Patton, 2002).

Content validity was established by giving the survey instrument to an expert panel for review (Higgins & Straub, 2006). Experts were selected based on their proficiency in survey research design and infectious diseases (refer to appendix H for the names of the reviewers). A cover letter was given to each reviewer (appendix I), along with the instrument. The instrument was revised according to their recommendations.

Principal Component Analysis (PCA) using a varimax rotation was used for construct validity. The results of PCA illustrated that protection motivation should be divided into two components, proactive protection motivation and passive protection motivation. The goal of PCA was to determine a correlational pattern among the observed variables and reduce these variables to a smaller number of factors and provide an operational definition to test the underlined process of the theory. Using varimax rotation with PCA, maximizes the high correlations between factors and variance by
increasing the high loadings and decreasing the lower ones for each factor (Tabachnick & Fidell, 2001) (refer to Table 3.1 in for the PCA results).

For reliability, the stability and the internal consistency of the instrument were measured. Stability of the instrument was evaluated through test-retest using a convenience sample of emergency nurses (n=23) at the UTMC. The nurses were given an instructional cover letter, the instrument and a return envelope. Within one week of completing the first survey, the same nurses were given another letter and the survey a second time (refer to appendix J and K for a copy of the letters). Internal consistency reliability was measured using Cronbach’s alpha ranging between 0 and 1, with a recommended alpha greater than or equal to 0.80 (Higgins & Straub, 2006). Cronbach’s alpha and Spearman rho coefficient were within acceptable ranges for all but two of the constructs. The variables, protection motivation and response cost had unacceptable scores. These items were modified to improve the scores (refer to appendix L for the test retest reliability summary and appendix M for the internal and stability reliability scores for the instrument).

e. Procedure

To reduce external validity threats and increase response rates, best practices in survey research were used. These include using the three-wave mailing process to maximize response rates. A systematic review of electronic survey has shown that non-monetary incentives, the use of a university letterhead and personalization of cover letters might increase response rate (Edwards et al., 2009).
For this study, a cover letter and an Adult Research Subject Information Sheet were sent to the selected participants. Each personalized letter was on the University of Toledo letterhead and included an outline of the purpose of the study, the link to the questionnaire, ensured confidentiality, provided contact information and signed personally by an ENA member and a practicing nurse at the University of Toledo. A $5 Starbucks gift card was emailed to each participant that completed the questionnaire. Postcards were sent to non-respondents two weeks apart to encourage them to participate in the study (refer to appendix N for the cover letter appendix O for the adult research subject information sheet, and appendix P for the postcard).

f. Statistical Analysis

Descriptive statistics (frequencies, mean and standard deviations), Spearman Rho Correlation, Kruskal-Wallis H Test and Stepwise Linear Regression were performed using SPSS 21. Nonparametric Kruskal-Wallis H Test was used to determine the whether there are statistically significant differences between the psychological variables and the demographic variables. A path analysis using EQS 6.1 was conducted to determine how well the data fits the model and identify the significant predictors for the outcome variables.

C. Results

a. Sample Characteristics

Of the randomly selected participants, 388 emergency nurses completed the online survey. The majority of the participants were
Caucasians (84%), females (75.5%), between the ages of 21 and 35 (33.3%), who are registered nurses (87.4%) that work in an urban setting (52.8%). The majority of the emergency nurses obtained a bachelor’s degree (54.4%) and had practiced emergency nursing for 11.2 years (SD=9.7 years) on average, with 29.4 hours (SD=14.2 hours) of direct care to patients. Of the emergency nurses that responded, 54.5% indicated that they received less than 10 hours of training at their place employment regarding controlling the Ebola infection.

b. **Bivariate Analysis**

The bivariate analyses for the demographic characteristics are documented in Table 3.2. The Kruskal-Wallis H test illustrated that there was a statistically significant differences between gender with regards to the participants proactive protection motivation ($H=.02, p<.05$), self-efficacy ($H=.01, p<.05$) and response cost ($H=.00, p<.05$). Among the age groups, there was a statistically significant difference with regards to the emergency nurses passive protection motivation ($H=.01, p<.05$). The amount of training hours on controlling the Ebola infection demonstrated a statistically significant difference between the individuals knowledge ($H=.02, p<.05$) and their response efficacy ($H=.03, p<.05$). The amount of training hours on controlling the Ebola infection receive from their place of employment illustrated a statistically significant difference between the emergency nurses knowledge ($H=.02, p<.05$), their perceived vulnerability
Having the necessary equipment and accommodation to give care to a possible patient with the Ebola infection demonstrated a statistically significant difference among the participant’s *proactive protection motivation* (H<.01 & =.03, p<.05), their *perceived vulnerability* (H=.01 & .04, p<.05) and their *self-efficacy* regarding the disease (H<.01, p<.05). Participants considered limited *knowledge* (H=.02, p<.05) as a contributor to the availability of accommodations at their place of employment. Feeling prepared to give care to possible patient with the Ebola infection demonstrated a statistically significant difference between the emergency nurses *knowledge* (H=.03, p<.05), their *passive protection motivation* (H<.01, p<.05), their *perceived vulnerability, self-efficacy, level of fear, response cost, their outcome expectations, perceived severity* (H<.01, p<.05) and their *response efficacy* (H=.01, p<.05). There was a statistically significant difference between the participants employment setting and their *proactive protection motivation* (H<.01, p<.05). The level of licensure is associated with the emergency nurse’s *proactive protection motivation* (H=.01, p<.05) and their *perceived severity* of the disease (H=.02, p<.05).

Spearman Rho Correlation matrix in **Table 3.3** displayed the computed score for each psychological variable when associated with the outcome variables. *Proactive protection motivation* was highly and
positively correlated with response efficacy ($\rho=.26$, $p<.01$), self-efficacy ($\rho=.18$, $p<.01$), outcome expectations ($\rho=.16$, $p<.01$) and perceived severity ($\rho=.17$, $p<.01$). Fear ($\rho=.08$), response cost ($\rho=.03$) and knowledge ($\rho=.03$) are positively correlated with proactive protection motivation.

The second outcome variable, passive protection motivation was highly and positively correlated with perceived vulnerability ($\rho=.34$, $p<.01$), fear ($\rho=.24$, $p<.01$), response cost ($\rho=.3$, $p<.01$) and outcome expectations ($\rho=.18$, $p<.01$). Knowledge ($\rho=-.18$, $p<.01$) was highly and negatively correlated with the second outcome variable. Perceived severity ($\rho=.05$) was positively correlated with passive protection motivation.

c. Path Analysis

Stepwise linear regression determined that response efficacy ($\beta=.27$, $t=4.5$, $p<.05$) and self-efficacy ($\beta=.17$, $t=2.8$, $p<.05$) were significant predictors for proactive protection motivation, while perceived vulnerability ($\beta=.26$, $t=4.7$, $p<.05$), response cost ($\beta=.19$, $t=3.3$, $p<.05$) and knowledge ($\beta=-.15$, $t=-2.8$, $p<.05$) were significant predictors for passive protection motivation. These predictors were used as a starting point in developing the path model. Multiple models were created and the identified best fit model included the following variables: proactive protection motivation, passive protection motivation perceived vulnerability, perceived severity, response efficacy, self-efficacy, response cost, outcome expectations and knowledge.
Outcome expectations, response efficacy and self-efficacy together accounted for 13% ($R^2$) of variance in emergency nurses’ proactive protection motivation. Figure 3.1 demonstrated that an increase in outcome expectations is associated with an increase in proactive protection motivation ($\beta=.12$, $p<.05$); an increase in response efficacy is associated with an increase in proactive protection motivation ($\beta=.24$, $p<.05$) and an increase in self-efficacy is associated with an increase in proactive protection motivation ($\beta=.18$, $p<.05$).

Perceived vulnerability, response cost and knowledge accounted for 16% ($R^2$) of variance in emergency nurses’ passive protection motivation. An increase in perceived vulnerability is related to an increase in passive protection motivation ($\beta=.27$, $p<.05$); an increase in response cost is related to an increase in passive protection motivation ($\beta=.20$, $p<.05$) and a decrease in knowledge is related to an increase in passive protection motivation ($\beta=-.14$, $p<.05$).

The fit indices in Table 3.4 displayed a satisfactory fit to the data, as demonstrated by the statistics and each cited threshold: $\chi^2$ (16)=17.89, $p=.33$ (Barrett, 2007), Bentler-Bonett Normed Fit Index (NFI)=.96 (Hu, 1999), Bentler-Bonett Non-Normed Fit Index (NNFI)=.99 (Hu, 1999), Comparative Fit Index (CFI)=1.00 (Hu, 1999), Bollen’s Fit Index (IFI)=1.00 (Bollen, 1990), McDonald’s Fit Index (MFI)=1.00 (Worthington & Whittaker, 2006), Joreskog-Sorbom’s Goodness of Fit (GFI) Index=.99 (Hooper, 2008), Joreskog-Sorbom’s Adjusted Goodness
of Fit (AGFI) Index=.97 (Hooper, 2008), Root Mean-Square Residual (RMR)= .03 (Hu, 1999), and Root Mean-Square Error of Approximation (RMSEA)=.02 (Hu, 1999) and its 90% Confidence Interval=.00-0.05 (Hooper, 2008).

Further, the outcome variables, proactive protection motivation and passive protection motivation are not associated direct but indirectly through multiple variables. Perceived vulnerability and self-efficacy accounted for 22% ($R^2$) of variance in emergency nurses’ response efficacy. A decrease in perceived vulnerability is associated with an increase in response efficacy ($\beta = -.26, p<.05$) and an increase in self-efficacy is associated with an increase in nurses response efficacy ($\beta = .34, p<.05$). Response cost and perceived severity accounted for 20% ($R^2$) of variance in emergency nurses’ outcome expectations. An increase in response cost is associated with an increase in outcome expectations ($\beta = .35, p<.05$) and an increase in perceived severity is associated with an increase in nurses outcome expectations ($\beta = .19, p<.05$). The construct fear was not included in the model because PMT defines the variable as a composite score of perceived vulnerability and perceived severity.

**D. Discussion**

The 2014 Ebola virus outbreak was considered one of the worst that not only affected the African region but also countries such as the United States that have low incidence and prevalence rates of the disease. Due to limited research conducted on the Ebola virus and its affect on healthcare professionals in the
United States, the study aimed to examine nurses’ protective practices and
determine their apprehension to give care to a possible patient who may have the
signs and symptoms of an Ebola infection. To our knowledge, this is the first
study to examine emergency nurses’ motivation to engage protective procedures
to help prevent the transmission of the Ebola virus based on demographics (i.e.
gender, race, level of education, current licensure, age, employment setting and
years of emergency nursing) and psychological variables (i.e. self-efficacy,
response efficacy, response cost, knowledge, outcome expectations, perceived
vulnerability, perceived severity, fear, protection motivation) from a modified
version of the Protection Motivation Theory.

The results from the study revealed a statistically significant relationship
between the participants and their motivation to protect themselves against the
infection. There are statistical significant differences between emergency nurses,
the outcome variables and some of the psychological variables. The outcome
variable, protection motivation was divided into (1) proactive protection
motivation and (2) passive protection motivation. The first outcome variable
focused on the nurses actively identifying or preventing the spread of the disease
by adhering to the rules and regulations set by their place of employment. The
second outcome variable examines the actions of nurses being inactively hands-
off if they were confronted with a situation where a patient might have the Ebola
infection.

Based on the results from the path analysis, response efficacy, self-efficacy
and outcome expectations predicted emergency nurses’ proactive protection
motivation. Both self-efficacy and response efficacy are part of the coping appraisal in the PMT model. Response efficacy assesses the belief that the recommended coping response might be effective in reducing their threat and self-efficacy assesses the perceived ability to perform the recommended coping response (Milne et al., 2000). Both constructs influence the nurses’ intentions to conduct the recommended coping response. Outcome expectations further explain the nurses’ belief that not performing a particular behavior might lead to certain consequences. The path coefficients from these three constructs indicate that higher self-efficacy, higher response efficacy or higher outcome expectations can lead to an increase in the nurses’ proactive protection motivation. However, demographics variables such as gender, employment setting, level of licensure and the availability of accommodations and equipment to provide care to a possible patient with an Ebola infection also affect the emergency nurses’ proactive protection motivation. In the model, response efficacy (β=.24) and self-efficacy (β=.18) were the strongest predictors for proactive protection motivation. These findings are consistent with previous studies that used PMT. Coping strategies available for the participants have a stronger effect on whether they will conduct the protective behavior. High response efficacy strengthens their intention to protect themselves and reinforces their belief that the protective behavior is effective (Milne et al., 2000; Rippetoe & Rogers, 1987).

For the second outcome variable, the path analysis indicated that perceived vulnerability, response cost and knowledge are predictive of passive protection motivation. Perceived vulnerability assesses the likelihood of
contacting the disease, *response cost* assesses the cost associated with performing the recommended protective behavior and *knowledge* is the amount of information needed to carry out the behavior (Milne et al., 2000; Montano & Kasprzyk, 2008). The more vulnerable a nurse believes they are the more likely they would exhibit *passive protection motivation* behavior. *Perceived vulnerability* ($\beta=.27$) was the strongest predictor of *passive protection motivation*. Vulnerability is associated with fear of the disease and believing that the individual has a higher likelihood of contracting and being exposed to the disease. Pervious researchers have examined behavioral intention and vulnerability relating to the individual hearing about the threat, assessing how dangerous the disease is and estimating their personal vulnerability before determining whether to perform the protective behavior (Milne et al., 2000).

Added to perceived vulnerability, the cost associated with the preventive behavior and the less knowledge they have about the disease led to an increase in *passive protection motivation*. Limited knowledge about the Ebola virus and the protective behaviors determine whether a nurse will actively perform the protective behavior or avoid their place of employment due to possible patients they might encounter. Media and incorrect information on the Ebola virus and the transmission of the disease can increase fear and perceived vulnerability among nurses. Acquiring knowledge and increasing training about the disease not only empower nurses but it might reduce passive protection motivation.

The difference in demographic variables contributed to the nurses’ *proactive protection motivation* and *passive protection motivation*. Gender, year
of birth, employment setting and current level of licensure demonstrated a
difference between the participants motivation to protect themselves. The
difference noted within these variables could be due to the participants that
responded to the survey and non-respondents might have lead to different
findings. Additionally, the differences among these demographic variables were
not separated by subgroups but were grouped together by the variable’s name.

Furthermore, the path analysis revealed that the outcome variables are not
directly associated but are indirectly related through response efficacy and
outcome expectations. Response efficacy links the outcome variable through
perceived vulnerability. Higher self-efficacy and lower perceived vulnerability
leads to higher response efficacy. Outcome expectation not only connects the
outcome variables but also includes perceived severity. An increase in the nurses’
perceived severity leads to their willingness to pay the cost associated and
perform the recommended protective behavior. The indirect link between passive
protection motivation and proactive protection motivation demonstrates that these
variables can exist without the other. However, an indirect connection and the
inclusion of additional variables made the path model stronger.

E. Limitation

There are some notable limitations in this study. The sample population
chosen was a randomized sample of emergency nurses who are members of ENA.
The ENA database is not representative of all emergency nurses in the U.S.,
which would be a potential threat to the external validity of the findings.
However, it could be hypothesized that ENA members might be professionally
dedicated and experienced and the current findings may be a conservative estimate of the nurses’ motivation to protect themselves when giving care to possible patients with an Ebola infection.

Additionally, the timing of the Ebola virus outbreak might have influence the nurses’ motivation towards engaging in protective practices while providing care to patients possibly infected with the disease. The outbreak occurred over a year before the survey was distributed and the nurses’ heightened awareness of the disease has reduced considerably, which affected the response rate. The study response rate was 23% (388/1686), which is generalizable to ENA members. Based on research conducted on power analysis, a sample size of 50,000 that is evenly split (50/50) with only +/-5% sampling error, needs a sample of 381 completed surveys (Price, Dake, Murnan, Dimmig, & Akpanudo, 2005). This supports the study’s response rate, which yielded a power of 93%. The power analysis indicated a strong probability that the research will not commit a type II error.

Previous research studies that have used emergency nurses as their sample population achieved relatively high response rate due to the research topic. Studies that focus on issues that have higher chances of occurring or are relevant to the health professional such as needle stick injuries, work place injuries, substance abuse, stress and exposure to common diseases tend to have high response rates (Kasprzyk, Montano, St. Lawrence, & Phillips, 2001). Research not conducted during heightened awareness of the disease or problems tend to have lower response rate. ENA conducted a violence surveillance study using
their membership database and they had a response rate of 9.5% after surveying a random sample of nurses for two years (Emergency Nurses Association: Institute for Emergency Nursing Research, 2011). Such topics as violence are only relevant to the participants if it happens directly to them. The same can be said for the Ebola virus outbreak, because most ENA members were not directly affected by the disease, so it was a low priority issue and they could not relate to what might motivate them to protect themselves against the disease.

Social desirability was another limitation that would be a potential threat because participants tend to answer the questions in a manner that is viewed as favorable by others. Finally, the nurses were limited in the responses and information they can provide, potentially compromising the internal and external validity findings elicited from the survey.

F. Recommendation

This study identified that perceived vulnerability, response cost and knowledge have an impact on whether the nurses exhibit passive protection motivation behavior. Thus, administrators may need to provide immediate training for nurses as soon as an outbreak occurs. They need to educate these nurses about the disease, its method of transmission and the protective equipment they would need to protect themselves. Immediate training acquired by the nurses would reduce their perceived vulnerability towards the disease and increase their self-efficacy and response efficacy towards the protective behavior. Additionally, administrators need to have the recommended equipment and accommodation available within these hospitals or clinics. Reducing the response cost such as
making the protective equipment readily available and up to date can limit the nurses’ passive protection motivation behavior. Finally, having a standard operating procedure (SOP) for receiving patients with potential Ebola infection is recommended.

G. Conclusion

Due to the sporadic occurrence of the Ebola virus, there are limited research studies. Future research should focus on conducting a longitudinal study that examines how knowledge affects the nurses’ motivation to protect themselves from the Ebola virus or other infectious diseases. Due to the low variance that accounted for the variables, this modified PMT model did not indicate very strong predictors for protection motivation. However, PMT has been used by previous researchers to examine the prevention of HIV and nurses’ motivation to care for HIV patients (Boer & Seydel, 1996; Milne et al., 2000). Since similar infectious diseases have used PMT to explore nurses’ motivation to care, this suggests that the theory is appropriate for this study. The use of other constructs to the original PMT model or modifying the survey items might be another suggestion that could increase the $R^2$ in the path model and indicate stronger predictors for protection motivation.

Additionally, expanding our collective understanding of variables that hinder healthcare professionals from giving care to patients that exhibit signs and symptoms of the Ebola virus might encourage protective behavior and discourage behaviors related to avoidance. Another future research study should be a qualitative study that examines the nurses’ perception to determine what they
perceive as the barriers or variables that might increase or decrease their motivation to protect themselves from possible patients with Ebola infection they might have encountered at work.

Legitimate reasons such as fear and limited knowledge affect whether the nurse conducts proactive protection motivation behavior or passive protection motivation behavior. To some extent emergency nurses are willing to provide care to these patients, however fear, possible response cost and limited knowledge hinders them from giving care. Efforts should be focused on providing support, training and resources that empowers them and encourage nurses to exhibit proactive protection motivation behavior.
<table>
<thead>
<tr>
<th>Constructs</th>
<th>Items</th>
<th>Components</th>
<th>Communalities</th>
<th>Cronbach’s alpha</th>
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<tr>
<td></td>
<td>Getting infected with Ebola.</td>
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<td>.96</td>
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<td>Vulnerability</td>
<td>Unknowingly spreading Ebola to my friends.</td>
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<td>.89</td>
<td></td>
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<td></td>
<td>Unknowingly spreading Ebola to another patient.</td>
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<td>.89</td>
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<tr>
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<td>Unknowingly spreading Ebola to my co-workers.</td>
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<td>.90</td>
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<tr>
<td></td>
<td>Dying from Ebola.</td>
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<td>Hospitalized due to Ebola.</td>
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<td>Being quarantined after exposure to Ebola.</td>
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<td>Spreading Ebola to my family members.</td>
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<td></td>
<td>Spreading Ebola to other co-workers.</td>
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<td>Correctly disinfecting areas used by a patient who show signs of Ebola infection.</td>
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<td>.82</td>
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<td></td>
<td>Attending Ebola infection control training.</td>
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<td>.60</td>
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<td>Properly wash my hands before and after each patient interaction.</td>
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<td>Properly wear and remove</td>
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<tr>
<td>Protection Motivation</td>
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<tr>
<td>Wash my hands before and after each patient interaction.</td>
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<tr>
<td>Wear personal protective equipment (i.e. scrub suits,</td>
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<td>mask, gloves, isolation gown, face shield and head cover)</td>
<td>.86</td>
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<td>with each patient interaction.</td>
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<tr>
<td>Attend Ebola infection control training.</td>
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<tr>
<td>Disinfect areas used by the patient.</td>
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<tr>
<td>Avoid coming to work to reduce my family’s exposure</td>
<td>.93</td>
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| Fear                                                                 |
|---------------------------------------------------------------------|----------------|
| Properly disinfect areas used by a patient who show signs of Ebola  | .87            |
| infection.                                                          |                |
| Properly implement Ebola infection control.                         | .90            |
| Correctly triage a patient.                                         | .67            |
| Acquiring Ebola.                                                    | .89            |
| Exposing my family to Ebola.                                        | .89            |
| Exposing another patient to Ebola.                                  | .90            |
| Dying from Ebola.                                                   | .90            |
| Unable to fulfill my family obligations.                            | .88            |
| Loss of income.                                                     | .81            |
| Being quarantined.                                                  | .78            |
| Being required to work longer hours.                                | .75            |
| Being infected with Ebola would increase my medical expenses.       | .74            |
| Being unable to arrange childcare or care for others who depend on me| .78            |
| Being quarantined would prevent me from fulfilling family obligations| .89            |
| Being infected with Ebola would keep me away from family and friends| .82            |
| Motivation                                                          |
| Motivation                                                          |
| Wash my hands before and after each patient interaction.            | .83            |
| Wear personal protective equipment (i.e. scrub suits, mask, gloves, isolation gown, face shield and head cover) with each patient interaction. | .86 |
| Attend Ebola infection control training.                            | .51            |
| Disinfect areas used by the patient.                                | .62            |
| Avoid coming to work to reduce my family’s exposure                | .93            |

| Response Cost                                                        |
|---------------------------------------------------------------------|----------------|
| Acquiring Ebola.                                                    | .89            |
| Exposing my family to Ebola.                                        | .89            |
| Exposing another patient to Ebola.                                  | .90            |
| Dying from Ebola.                                                   | .90            |
| Unable to fulfill my family obligations.                            | .88            |
| Loss of income.                                                     | .81            |
| Being quarantined.                                                  | .78            |
| Being required to work longer hours.                                | .75            |
| Being infected with Ebola would increase my medical expenses.       | .74            |
| Being unable to arrange childcare or care for others who depend on me| .78            |
| Being quarantined would prevent me from fulfilling family obligations| .89            |
| Being infected with Ebola would keep me away from family and friends| .82            |

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<th>Protection Motivation</th>
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<td>Motivation</td>
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<th>Protection Motivation</th>
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<tbody>
<tr>
<td>Motivation</td>
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<table>
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<th>Protection Motivation</th>
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<tbody>
<tr>
<td>Motivation</td>
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<tr>
<td>Outcome Expectations</td>
<td>Probability 1</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Become seriously ill from an Ebola infection.</td>
<td>0.82</td>
</tr>
<tr>
<td>Infect my family with Ebola.</td>
<td>0.94</td>
</tr>
<tr>
<td>Infect my friends with Ebola.</td>
<td>0.91</td>
</tr>
<tr>
<td>Infect another patient with Ebola.</td>
<td>0.90</td>
</tr>
<tr>
<td>Die from an Ebola infection.</td>
<td>0.82</td>
</tr>
<tr>
<td>Be placed on medical leave for an extended period.</td>
<td>0.72</td>
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**Note:** Knowledge Construct: KR-20=0.48
### Table 3.2: Demographics and Characteristics of the Respondents and Kruskal-Wallis H Test

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<th>Characteristics</th>
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<td>Gender</td>
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**p<0.01; *p<0.05 |
### Table 3.3: Spearman Rho Correlation Matrix Showing the Bivariate Correlations between the Modified Protection Motivation Theory Constructs

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<th>PM1</th>
<th>PM2</th>
<th>PV</th>
<th>RE</th>
<th>SE</th>
<th>FEAR</th>
<th>RC</th>
<th>OE</th>
<th>PS</th>
<th>KN</th>
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<td>PV</td>
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<td>RE</td>
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<td>SE</td>
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<td>-0.28**</td>
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<tr>
<td>FEAR</td>
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<td>0.24**</td>
<td>0.39**</td>
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<td>1.00</td>
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<td>OE</td>
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<td>0.18**</td>
<td>0.24**</td>
<td>0.03</td>
<td>-0.07</td>
<td>0.50**</td>
<td>0.41**</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PS</td>
<td>0.17**</td>
<td>0.05</td>
<td>0.09</td>
<td>0.04</td>
<td>-0.02</td>
<td>0.49**</td>
<td>0.32**</td>
<td>0.37**</td>
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<td>KN</td>
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<td>-0.18**</td>
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<td>0.12*</td>
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<td>-0.00</td>
<td>0.01</td>
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<table>
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<tr>
<th>Fit Indices</th>
<th>Statistics</th>
<th>Acceptable threshold levels</th>
</tr>
</thead>
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<tr>
<td>Chi-square ($\chi^2$), df, p-value</td>
<td>17.858, 16, .332</td>
<td>$p &gt; .05$ (Barrett, 2007)</td>
</tr>
<tr>
<td>Bentler-Bonett Normed Fit Index (NFI)</td>
<td>.958</td>
<td>$\geq .95$ (Hu, 1999)</td>
</tr>
<tr>
<td>Bentler-Bonett Non-Normed Fit Index (NNFI)</td>
<td>.989</td>
<td>$\geq .95$ (Hu, 1999)</td>
</tr>
<tr>
<td>Comparative Fit Index (CFI)</td>
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<td>$\geq .95$ (Hu, 1999)</td>
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<tr>
<td>Bollen’s Fit Index (IFI)</td>
<td>.995</td>
<td>$&gt;.90$ (Bollen, 1990)</td>
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<td>McDonald’s Fit Index (MFI)</td>
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<td>$&gt;.90$ (Worthington &amp; Whittaker, 2006)</td>
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<td>$&gt;.90$ (Hooper, 2008)</td>
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<td>Joreskog-Sorbom’s Fit Index (AGFI)</td>
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<td>$&gt;.90$ (Hooper, 2008)</td>
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<tr>
<td>Root Mean-Square Residual (RMR)</td>
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<td>$&lt;.08$ (Hu, 1999)</td>
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<tr>
<td>Root Mean-Square Error of Approximation (RMSEA)</td>
<td>.017</td>
<td>$&lt;.06$ (Hu, 1999)</td>
</tr>
<tr>
<td>90% CI of RMSEA</td>
<td>.000-.052</td>
<td>Lower CI closer to 0 Upper CI &lt;.08 (Hooper, 2008)</td>
</tr>
</tbody>
</table>
**Figure 3.1:** Path Analysis Showing Modified PMT Constructs Predicting Emergency Nurses’ Motivation to Protect Themselves against Ebola Infection

*Note:* All path coefficients are significant at the .05 level
CHAPTER FOUR

Discussion

This chapter provides a comprehensive summary that demonstrates the link across both Ebola virus studies. It includes a synopsis for study one regarding the health behavior, environmental, and social factors associated with the transmission of the Ebola virus during the 2014 outbreak. The second study examined psychological variables associated with what motivates emergency nurses’ to protect themselves from possible patient, who might exhibit signs and symptoms of the Ebola virus. Summaries of fail to reject and rejected hypotheses for both studies and discussion of the results are included. Finally, recommendations are made that might assist with prevention and control of future Ebola virus outbreaks.

The chapter is divided into the following subsections: (1) summary of studies, (2) accepted and rejected hypotheses, (3) discussion, (4) recommendations and (5) conclusion.

A. Summary of Studies

a. Study One

The Ebola virus is a highly transmissible disease that sporadically appears and has devastated towns, villages and cities, especially in Africa. The virus was discovered in 1976 and resulted in 53% and 89% mortality rates in Sudan and the Democratic Republic of Congo respectively. Since its discovery, the disease has caused at least 14 outbreaks between 1976 and 2006 in Africa (Legrand et al., 2007).
In 2014, the Ebola virus reappeared in Gueckedou, Guinea and spread to neighboring countries of Liberia and Sierra Leone and other countries in the West African region (K.A. Alexander et al., 2014). This outbreak was considered one of the worst, with approximately 28,603 confirmed, suspected and probable cases reported in early 2016. From this total, 15,217 were laboratory confirmed cases and 11,301 deaths (Centers for Disease Control and Prevention, 2016).

Thus far, there is very little known about this highly contagious and deadly disease that claims between 50% and 90% of the infected (Legrand et al., 2007). Researchers have conducted numerous studies that focus on the biological and epidemiological features of the virus and disease. However, there are limited studies on factors associated with the rapid spread of the virus among human beings. Socio-cultural factors contribute immensely to the spread of the disease, especially cultural practices within the African region (Chowell & Nishiura, 2014; Hewlett & Amola, 2003). There is limited information on how cultural practices such burial practices, funerals, use of traditional healers and cures and the consumption of ‘bush meat’ is associated with the rapid spread of Ebola virus (K.A. Alexander et al., 2014; Hewlett & Amola, 2003; Jones, 2011).

Behavioral, environmental and social factors also affect the spread and transmission of the virus. Due to limited research, this study aims to bridge the gap by determining the factors that might be associated with the 2014 Ebola virus outbreak. The purpose of the study is to use the Ecological Model
to identify the behavioral, environmental and social factors associated with the spread of the 2014 Ebola virus within three countries affected by the outbreak.

The study used an ecological correlational design to investigate the behavioral, environmental and social factors associated with the 2014 confirmed, probable and suspected cases of the Ebola virus. Data on the Ebola virus outbreak was collected for each district within Liberia, Nigeria and Sierra Leone from each countries respective Ministry of Health’s daily outbreak reports. The latest information available for each possible determinant was collected from surveys conducted by each country’s Ministry of Health with the assistance from credible international agencies.

Spearman Rho Correlation and Stepwise Linear Regression determined the outcome variables that indicated meaningful significant predicting variables. The outcome variables were Ebola morbidity (initial confirmed cases and initial suspected cases) and Ebola mortality (initial probable deaths and latest confirmed deaths). The study provided meaningful findings and predictors that illustrated the association between these outcome variables and behavioral, environmental and social factors that can explain the rapid spread and death by Ebola infection.

The regression determined that higher females unemployment rates ($\beta=.4, t=-3.9, p<.01$), more sexual activity among men ($\beta=.4, t=-3.1, p<.01$), less women who can read part of a sentence ($\beta=-.4, t=-3.9, p<.01$), less men with some secondary education ($\beta=-.6, t=-4.3, p<.01$) and fewer children who take antibiotic drugs for treating fever ($\beta=-.3, t=-2.2, p<.05$) are significantly
associated with confirmed Ebola cases reported at the beginning of the outbreak. In sum, 65% of the variance in predicting the initial confirmed cases can be explained by these variables.

For initial suspected Ebola cases, more money provided to healthcare ($\beta = .6, t = 6.6, p < .01$), an increase in women needing permission to seek healthcare ($\beta = .4, t = 4.1, p < .01$), an increase in the use of lakes, rivers, dams or streams as a main source of drinking water ($\beta = .3, t = 3.1, p < .01$), people that leave a child’s stool out in the open ($\beta = -.3, t = -2.9, p < .01$) and men with some secondary education ($\beta = .2, t = 2.2, p < .05$) are a significant predictor. In sum, 73% of the variance in predicting these cases can be explained by these variables.

Children under the age of 5 who were treated for fever in a health facility or by a provider ($\beta = .3, t = 3.2, p < .01$), main source of drinking water piped from the compound, yard or plot ($\beta = .3, t = 3.0, p < .01$) and obtained from lakes, rivers, dams or streams ($\beta = -.3, t = -2.7, p < .05$), women who never had sexual intercourse ($\beta = -.7, t = -5.7, p < .01$), households that refused permission to see whether there was water and soap available for hand washing ($\beta = .3, t = 3.4, p < .01$), men with some secondary education ($\beta = .6, t = 5.7, p < .01$) and households that refused to show their availability of soap at their place of hand washing ($\beta = -.2, t = -2.3, p < .05$) were determined as significant predictors for confirmed Ebola deaths that occurred towards the end of the outbreak. In sum, 74% of the variance in predicting these latest confirmed deaths can be explained by these variables.
Based on the regression, households that use pit latrine with as slab as their sanitation facility ($\beta=.2, t=2.8, p<.05$), women needing permission to seek healthcare ($\beta=.6, t=10.7, p<.01$) and women do not want to go alone for healthcare ($\beta=-.2, t=-4.0, p<.01$), female unemployment ($\beta=.4, t=9.2, p<.01$), households that refused to show their availability of soap at their place of hand washing ($\beta=.6, t=7.0, p<.01$), safely disposing ($\beta=-.3, t=-6.0, p<.01$) and burying ($\beta=-.1, t=-3.4, p<.01$) a child’s stool, men with some primary education ($\beta=-.1, t=-2.7, p<.05$) and households with water but no soap available for hand washing ($\beta=.1, t=2.3, p<.05$) were significant predictors for possible Ebola deaths reported at the beginning of the outbreak. In sum, 96% of the variance in predicting these initial probable deaths can be explained by these variables.

b. Study Two

The 2014 Ebola virus outbreak affected countries outside the African region such as the United States. Due to the sporadic occurrence of the virus, there has been limited research on the care provided to possible patients with an Ebola infection within countries such as the United States that usually have very low prevalence rate during past outbreaks (Centers for Disease Control and Prevention, 2010). Furthermore, there is insufficient research on healthcare professional’s protection motivation when they give care to possible patients with the Ebola virus. In most healthcare settings, the emergency room is the first point of entry and the nurses have an increased risk of exposure to the virus.
The purpose of the study was to use a modified Protection Motivation Theory (PMT) to explore the United States emergency nurses’ motivation to protect themselves against possible patients with an Ebola infection they might encounter at work and its predictors. Five constructs from the PMT model, i.e. perceived vulnerability, perceived severity, response cost, self-efficacy, response efficacy and fear were used to investigate attitude and behavior change through matching cognitive processes people use to evaluate threats and select coping alternatives (Floyd et al., 2000; Milne et al., 2000). Two additional constructs, i.e. knowledge and outcome expectations, were also included in the study.

The study population was emergency nurses who are members of ENA living in the United States. The study design was a non-experimental, descriptive cross-sectional online survey administered to a random sample of nurses. Participants were mailed a cover letter with the link to the survey and given an incentive upon completion. The questionnaire consisted of theory constructs, knowledge-based questions and demographics. The outcome variable was protection motivation and explanatory variables were perceived vulnerability, perceived severity, response cost, self-efficacy, response efficacy, knowledge, outcome expectations, fear and demographics. After PCA was conducted the outcome variable was treated as two separate variables; proactive protection motivation and passive protection motivation.

Kruskal-Wallis H test and Spearman Rho Correlation were used for bivariate analysis. Kruskal-Wallis test determined the significant differences
in the psychological variables by the demographic variables. The computed scores for each psychological variable determined that proactive protection motivation was highly and positively correlated with response efficacy ($\rho=.26$, $p < .01$), self-efficacy ($\rho=.18$, $p < .01$), outcome expectations ($\rho=.16$, $p < .01$) and perceived severity ($\rho=.17$, $p < .01$). Fear ($\rho=.08$), response cost ($\rho=.03$) and knowledge ($\rho=.03$) are positively correlated with proactive protection motivation.

The second outcome variable, passive protection motivation was highly and positively correlated with perceived vulnerability ($\rho=.34$, $p < .01$), fear ($\rho=.24$, $p < .01$), response cost ($\rho=.3$, $p < .01$) and outcome expectations ($\rho=.18$, $p < .01$). Knowledge ($\rho=-.18$, $p < .01$) was highly and negatively correlated with the second outcome variable. Perceived severity ($\rho=.05$) was positively correlated with passive protection motivation.

Path analysis was performed to obtain a pictorial representation of the theoretical model and relationship between the constructs. Three constructs, outcome expectations, response efficacy and self-efficacy significantly accounted for 13% ($R^2$) of the variance in predicting the emergency nurse proactive protection motivation. An increase in outcome expectations is associated with an increase in proactive protection motivation ($\beta=.12$, $p < .05$); an increase in response efficacy is associated with an increase in proactive protection motivation ($\beta=.24$, $p < .05$) and an increase in self-efficacy is associated with an increase in proactive protection motivation ($\beta=.18$, $p < .05$).
Perceived vulnerability, response cost and knowledge accounted for 16% ($R^2$) of the variance in predicting the emergency nurse passive protection motivation. An increase in perceived vulnerability is related to an increase in passive protection motivation ($\beta = .27, p < .05$); an increase in response cost is related to an increase in passive protection motivation ($\beta = .20, p < .05$) and a decrease in knowledge is related to an increase in passive protection motivation ($\beta = -.14, p < .05$).

Path analysis results indicated a satisfactory fit to the data, as demonstrated by the statistics and each cited threshold: $\chi^2 (16) = 17.89, p = .33$ (Barrett, 2007), Bentler-Bonett Normed Fit Index (NFI)=.96 (Hu, 1999), Bentler-Bonett Non-Normed Fit Index (NNFI)=.99 (Hu, 1999), Comparative Fit Index (CFI)=1.00 (Hu, 1999), Bollen’s Fit Index (IFI)=1.00 (Bollen, 1990), McDonald’s Fit Index (MFI)=1.00 (Worthington & Whittaker, 2006), Joreskog-Sorbom’s Goodness of Fit (GFI) Index=.99 (Hooper, 2008), Joreskog-Sorbom’s Adjusted Goodness of Fit (AGFI) Index=.97 (Hooper, 2008), Root Mean-Square Residual (RMR)=.03 (Hu, 1999), and Root Mean-Square Error of Approximation (RMSEA)=.02 (Hu, 1999) and its 90% Confidence Interval=.00-0.05 (Hooper, 2008).

The outcome variables, proactive protection motivation and passive protection motivation are not associated direct but indirectly through response efficacy and outcome expectations. Response efficacy links the outcome variables through perceived vulnerability. Outcome expectation not only connects the outcome variables but also includes perceived severity. The
construct *fear* was not included in the model because PMT defines the variable as a composite score of *perceived vulnerability* and *perceived severity*.

**B. Failed-to-Reject Hypotheses**

The results of the study two failed to reject the following hypotheses:

1.1. Emergency nurses’ *proactive protection motivation* does not differ by race, year of birth, level of nursing education, amount of training received on Ebola infection control, amount of training received on Ebola infection control from their place of employment, their preparedness to give care to a possible patient with an Ebola infection, the amount of hours spend on providing direct care to patients and the amount of years working as an emergency nurse.

1.2. Emergency nurses’ *passive protection motivation* does not differ by gender, race, level of nursing education, amount of training received on Ebola infection control, amount of training received on Ebola infection control from their place of employment, having the necessary equipment and accommodations at their place employment to give care to a possible patient with an Ebola infection, employment setting, level of licensure, the amount of hours spend on providing direct care to patients and the amount of years working as an emergency nurse.

1.3. Emergency nurses’ *perceived vulnerability* does not differ by gender, race, year of birth, level of nursing education, amount of training received on Ebola infection control, employment setting, level of licensure, the amount of hours spend on providing direct care to patients and the amount of years working as an emergency nurse.
1.4. Emergency nurses’ *response efficacy* does not differ by gender, race, year of birth, level of nursing education, having the necessary equipment and accommodations at their place of employment to give care to a possible patient with an Ebola infection, employment setting, level of licensure, the amount of hours spent on providing direct care to patients and the amount of years working as an emergency nurse.

1.5. Emergency nurses’ *self-efficacy* does not differ by race, year of birth, level of nursing education, amount of training received on Ebola infection control, amount of training received on Ebola infection control from their place of employment, having the necessary equipment and accommodations at their place of employment to give care to a possible patient with an Ebola infection, employment setting, level of licensure, the amount of hours spent on providing direct care to patients and the amount of years working as an emergency nurse.

1.6. Emergency nurses’ *fear* does not differ by gender, race, year of birth, level of nursing education, amount of training received on Ebola infection control, amount of training received on Ebola infection control from their place of employment, having the necessary equipment and accommodations at their place of employment to give care to a possible patient with an Ebola infection, employment setting, level of licensure, the amount of hours spent on providing direct care to patients and the amount of years working as an emergency nurse.

1.7. Emergency nurses’ *response cost* does not differ by race, year of birth, level of nursing education, amount of training received on Ebola infection control, amount of training received on Ebola infection control from their place of employment, having the necessary equipment and accommodations at their place of employment to give care to a possible patient with an Ebola infection, employment setting, level of licensure, the amount of hours spent on providing direct care to patients and the amount of years working as an emergency nurse.
employment, having the necessary equipment and accommodations at their place employment to give care to a possible patient with an Ebola infection, employment setting, level of licensure, the amount of hours spend on providing direct care to patients and the amount of years working as an emergency nurse.

1.8. Emergency nurses’ *outcome expectations* does not differ by gender, race, year of birth, level of nursing education, amount of training received on Ebola infection control, amount of training received on Ebola infection control from their place of employment, having the necessary equipment and accommodations at their place employment to give care to a possible patient with an Ebola infection, employment setting, level of licensure, the amount of hours spend on providing direct care to patients and the amount of years working as an emergency nurse.

1.9. Emergency nurses’ *perceived severity* does not differ by gender, race, year of birth, level of nursing education, amount of training received on Ebola infection control, having the necessary equipment and accommodations at their place employment to give care to a possible patient with an Ebola infection, employment setting, the amount of hours spend on providing direct care to patients and the amount of years working as an emergency nurse.

1.10. Emergency nurses’ *knowledge* does not differ by gender, race, year of birth, level of nursing education, having the necessary equipment at their place employment to give care to a possible patient with an Ebola infection, employment setting, level of licensure, the amount of hours spend on providing direct care to patients and the amount of years working as an emergency nurse.
2.1. Emergency nurses’ response efficacy, self-efficacy, outcome expectations, perceived severity, response cost, knowledge and fear are not correlated with proactive protection motivation.

2.2. Emergency nurses’ perceived vulnerability, fear, response cost, outcome expectations, perceived severity and knowledge are not correlated with passive protection motivation.

3.1. Emergency nurses’ response efficacy and self-efficacy are not predictors for their proactive protection motivation.

3.2. Emergency nurses’ perceived vulnerability, response cost and knowledge are not predictors for their passive protection motivation.

4.1. The model does not exhibit a direct causal effect among the variables.

C. Rejected Hypotheses

The following hypotheses were rejected in study one:

2.1. There are no behavioral, environmental and social factors significantly associated with Ebola mortality and morbidity during the 2014 outbreak.

3.1. There are no statistically significant predicting behavioral, environmental and social factors for Ebola mortality and morbidity during the 2014 outbreak.

The following hypotheses were rejected in study two:

1.1. Emergency nurses’ proactive protection motivation does not differ by gender, having the necessary equipment and accommodations at their place employment to give care to a possible patient with an Ebola infection, employment setting and their level of licensure.
1.2. Emergency nurses’ *passive protection motivation* does not differ by year of birth and their preparedness to give care to a possible patient with an Ebola infection.

1.3. Emergency nurses’ *perceived vulnerability* does not differ by amount of training received on Ebola infection control, amount of training received on Ebola infection control from their place of employment, having the necessary equipment and accommodations at their place employment and their preparedness to give care to a possible patient with an Ebola infection.

1.4. Emergency nurses’ *response efficacy* does not differ by amount of training received on Ebola infection control, amount of training received on Ebola infection control from their place of employment and their preparedness to give care to a possible patient with an Ebola infection.

1.5. Emergency nurses’ *self-efficacy* does not differ by gender and their preparedness to give care to a possible patient with an Ebola infection.

1.6. Emergency nurses’ *fear* does not differ by their preparedness to give care to a possible patient with an Ebola infection.

1.7. Emergency nurses’ *response cost* does not differ by gender and their preparedness to give care to a possible patient with an Ebola infection.

1.8. Emergency nurses’ *outcome expectations* do not differ by their preparedness to give care to a possible patient with an Ebola infection.

1.9. Emergency nurses’ *perceived severity* does not differ by the amount of training received on Ebola infection control from their place of employment, their level
of preparedness to give care to a possible patient with an Ebola infection and
their level of licensure.

1.10. Emergency nurses’ *knowledge* does not differ by amount of training received on
Ebola infection control, having the necessary equipment and accommodations at
their place employment and their preparedness to give care to a possible patient
with an Ebola infection.

2.1. Emergency nurses’ *passive protection motivation* and *perceived vulnerability*
are not correlated with *proactive protection motivation*.

2.2. Emergency nurses’ *response efficacy*, and *self-efficacy* are not correlated with
*passive protection motivation*.

3.1. Emergency nurses’ *perceived vulnerability, fear, response cost, outcome
expectations, perceived severity, knowledge* and *passive protection motivation*
are not predictors for their *proactive protection motivation*.

3.2. Emergency nurses’ *response efficacy, self-efficacy, perceived severity, fear,
outcome expectations* and *proactive protection motivation* are not significantly
predictors for their *passive protection motivation*.

4.2. The model does not exhibit an indirect causal effect among the variables.

**D. Discussion**

The first research study examined possible determinants (behavioral,
environmental and social factors) that were significant predictors for Ebola morbidity
and mortality during the 2014 outbreak. The significant findings illustrated that
environmental factors were largely responsible for the transmission of the virus and
the increased mortality rates. Environmental factors are lack of physical items and
influences within the community that can increase the chances of becoming infected or dying from the Ebola virus. These factors are related to preventive methods that limit the spread and transmission of the disease.

Both social and behavioral factors contribute to the transmission and death by the disease. However, these factors are not shown to be largely responsible in determining the rapid spread and transmission of the virus. This finding is consistent with one research study that examined the factors that lead to the emergence of the 2014 outbreak. The researchers determined that the interaction with wildlife, social infrastructure, behavioral and cultural practices led to an increase of disease transmission (K.A. Alexander et al., 2014).

The second research study examined the protection motivation of healthcare professionals in a country with low prevalence for the Ebola virus. To our knowledge, this study is the first that investigated emergency nurses’ protection motivation in relation to demographics and selected psychological variables. The psychological variables examined the nurses’ perceived vulnerability, perceived severity, response efficacy, self-efficacy, fear, response cost and outcome expectations towards the disease and knowledge about the Ebola virus. The outcome variable, protection motivation was divided into (1) proactive protection motivation and (2) passive protection motivation.

The results outlined significant relationships between the outcome variables, selected psychological variables and the participant demographics. Response efficacy, self-efficacy and outcome expectations are predictors for emergency nurses’ proactive protection motivation. These three constructs emphasize that a higher self-efficacy
and the more nurses’ beliefs that adhering to certain preventive measures leads to an increase in *proactive protection motivation*.

The predictors of the second outcome variable, *passive protection motivation*, included *perceived vulnerability*, *response cost* and *knowledge*. The more vulnerable a nurse believes they are the more likely they would exhibit *passive protection motivation* behavior. Furthermore, the higher cost associated with the preventive behavior and the less knowledgeable they are about the disease might lead to an increase in *passive protection motivation*.

PMT has been used in studies that focus on disease prevention, enhancing healthy lifestyles, reducing alcohol and tobacco use and early preventive health screenings. However, these studies have used all or part of the PMT model to determine the participant’s protection motivation. Study two used some of the PMT constructs and incorporated two additional variables that enhanced the model. The original PMT model included three components: (1) the magnitude of noxiousness of a depicted event, (2) the probability that the event will occur and (3) the effectiveness of a coping response to the event. These three components led to the cognitive meditational processes, (1) perceived severity, (2) perceived vulnerability and (3) response efficacy (Milne et al., 2000; Rogers, 1975).

These cognitive processes mediate the effects related to fear appeals by arousing “protection motivation.” Protection motivation is an intervening variable that arouses, sustains and directs activities to protect against danger. The variable arouses the cognitive appraisal processes, which leads to attitude and behavior changes. It is typically measured by behavioral intentions to adopt the recommended
coping responses, however maladaptive coping responses such as avoidance can lead to negative consequences (Boer & Seydel, 1996; Rogers, 1975).

PMT clearly emphasizes that an individual will either cope or avoid a dangerous event rather than escape from an unpleasant emotional state of fear (Rogers, 1975). In the path model, it illustrated a difference in the types of adaptive responses (protection motivation) that occur during a dangerous event. However, the theory does not consider whether the decision maker is rational. The division of the outcome variable, demonstrated that the participants engaged in defensive avoidance or chose to follow precautionary methods (Rogers, 1985). The theory continued to evolve with the addition of the self-efficacy construct, which provided a further understanding of an individual’s belief of whether they are capable of performing the coping behavior (Maddux & Rogers, 1983).

The fourth component, self-efficacy was added to PMT from the Self-Efficacy Theory developed by Bandura. The theory determined that self-efficacy is part of effective coping and can mediate behavioral changes (Bandura, 1977; Maddux & Rogers, 1983). Based on Bandura (1977) both probability of occurrence and the effectiveness of a coping response can be viewed as outcome expectation that lead to undesirable events (Maddux & Rogers, 1983).

Both outcome variables in study two are not directly association but are indirectly related through the nurses’ response efficacy and their outcome expectations. Outcome expectation is not part of the PMT model but the theory uses its definition to explain the response efficacy construct. Based on the path analysis, the model illustrates a relationship between outcome expectations and perceived
severity due to the definition similarities of response efficacy and outcome expectations. According to Rogers (1983), it can be assumed that if response efficacy is low, then the increments in perceived severity will either have no effect or reduce the intentions to comply with the recommendations (Rogers, 1983). Furthermore, perceived severity is a cognitive meditational process that is clearly related to response efficacy. Response cost or psychological cost is associated with outcome expectations in the path model. The cost to perform the protective behavior may undermine protection motivation (Hodgkins & Orbell, 1998). Costs associated with the behavior an individual chooses might affect their belief in the effectiveness of the protective behavior.

Additionally, there is a relationship between response efficacy and perceived vulnerability because they are both cognitive meditational processes that predict protection motivation. An increase in response efficacy will lead to perceived vulnerability having a simple main effect on intentions (Rogers, 1983). Similarly, PMT might be able to integrate many variables such as demographic variables that lack a clear connection with a substantive theory. These variables may be incorporated as part of the PMT model to create a logical theoretical framework (Rogers, 1975). Demographic variables can affect the emergency nurses’ proactive protection motivation and passive protection motivation concerning giving care to possible patients with an Ebola infection. Based on the path model, it illustrates a clear interaction between each PMT construct, two additional constructs and demographic variables. Unlike the conceptual model developed by Roger (1975, 1983) and used in other research studies, study two demonstrates how each variable
affects the others and predicts protection motivation with regards to an infectious disease.

E. Recommendations

The results from the two research studies have very important significance to global health and healthcare professionals. Therefore, the following recommendations are based on the findings from the secondary data analysis research study.

- Provide comprehensive training to health care workers in countries with high prevalence and incidence for the Ebola virus.
- Expand our collective understanding of health behavior factors that are associated with the transmission of the disease.
- Recommended equipment and accommodations should be readily available and up to date within hospitals or clinics in case they have to give care to a possible patient with an Ebola infection.

The following recommendations are based on the findings from the descriptive cross sectional study.

- Expand our collective understanding of psychological variables that hinder healthcare professionals from providing care to patients that exhibit the signs and symptoms of an Ebola infection.
- Provide immediate comprehensive training to individuals that provide direct care to patients daily within countries that have low incidence and prevalence of the Ebola virus.
- Recommended equipment and accommodations should be readily available and up to date within hospitals or clinics in case they have to give care to a possible patient with an Ebola infection.
- Develop a standard operating procedure for receiving potential patients with an Ebola infection.

F. Conclusion

The Ebola virus has been around for many years, however there has been insufficient research conducted on certain aspects of the disease. The disease occurs sporadically and mostly in the African region. It is a very lethal virus that kills unto 80% of the infected. Due to its infrequent occurrence, most of the research conducted focus on the biology and epidemiology of the disease, with limited concentration on health behavior factors associated with the rapid spread and transmission of the disease.

Additionally, researchers have focused on areas with a higher prevalence for the disease. The 2014 outbreak illustrated that countries with low disease prevalence are ill equipped and vulnerable to the virus. Furthermore, it demonstrated that research is needed that focuses on the health behavioral aspects associated with the Ebola virus transmission. Specifically, examining countries with high disease prevalence to determine the health behavior factors related to the transmission of the disease and low disease prevalence countries to determine their health professionals’ motivation to protect patients that might exhibit the signs and symptoms of an Ebola infection. The findings in both research studies highlight the health behavior factors
and protection motivation that might increase or decrease the transmission of an Ebola infection.

Limited knowledge and training on this disease is shown to be possible indicates for the transmission and protection motivation towards the disease. Factors relating to economy, social and political infrastructure in countries with high prevalence for the disease contributes to insufficient training, equipment, accommodations and the investigation of health behavior factors. Similarly, fear, limited knowledge and the cost associated with the protective behavior determine the protection motivation of a healthcare professional in a country with low disease prevalence. Administrators in both low and high Ebola virus prevalence countries should determine these health behavior factors and protection motivation that might affect the transmission and care provided during future outbreaks.
References


http://apps.who.int/healthinfo/systems/datacatalog/index.php/catalog/25


http://www.mohsw.gov.lr/


http://nigeria.prognoz.com/en/DataAnalysis

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http://reliefweb.int/sites/reliefweb.int/files/resources/MICS4_SierraLeone_2010_FinalReport.pdf


http://www.who.int/mediacentre/factsheets/fs103/en/


World Health Organization:

http://www.who.int/water_sanitation_health/WASH_and_Ebola.pdf

### Appendix A: Research Questions, Research Hypotheses & Statistical Test for Study One

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Outcome Variable (DV)</th>
<th>Predictor Variable (IV)</th>
<th>Statistical Test</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RQ1:</strong> What is the distribution of behavioral, environmental and social factors that might be related to Ebola mortality and morbidity during the 2014 outbreak?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H1.1</td>
<td>No hypotheses needed for descriptive data.</td>
<td>Behavioral, Environmental &amp; Social Factors</td>
<td>Mean, SD, Min. &amp; Max.</td>
</tr>
<tr>
<td><strong>RQ2:</strong> What are the behavioral, environmental and social factors associated with Ebola mortality and morbidity during the 2014 outbreak?</td>
<td></td>
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<tr>
<td>H2.1</td>
<td>There are no behavioral, environmental and social factors significantly associated with Ebola mortality and morbidity during the 2014 outbreak.</td>
<td>Ebola Mortality &amp; Morbidity</td>
<td>Behavioral, Environmental &amp; Social Factors</td>
</tr>
<tr>
<td>H2.2</td>
<td>There are statistically significant associations between the behavioral, environmental and social factors and Ebola mortality and morbidity during 2014 outbreak.</td>
<td>Ebola Mortality &amp; Morbidity</td>
<td>Behavioral, Environmental &amp; Social Factors</td>
</tr>
<tr>
<td><strong>RQ3:</strong> What are the significant predicting behavioral, environmental and social factors for Ebola mortality and morbidity during the 2014 outbreak?</td>
<td></td>
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<tr>
<td>H3.1</td>
<td>There are no statistically significant predicting behavioral, environmental and social factors for Ebola mortality and morbidity during the 2014 outbreak.</td>
<td>Ebola Mortality &amp; Morbidity</td>
<td>Behavioral, Environmental &amp; Social Factors</td>
</tr>
<tr>
<td>H3.2</td>
<td>There are statistically significant predicting behavioral, environmental and social factors for Ebola mortality and morbidity during the 2014 outbreak.</td>
<td>Ebola Mortality &amp; Morbidity</td>
<td>Behavioral, Environmental &amp; Social Factors</td>
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**Appendix B: Research Questions, Research Hypotheses & Statistical Test for Study Two**

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Outcome Variable (DV)</th>
<th>Predictor Variable (IV)</th>
<th>Statistical Test</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RQ1:</strong> What is the distribution of investigated and demographic variables that are related to an emergency nurses’ motivation to protect themselves against possible Ebola infection?</td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>H1.1</strong> No hypotheses needed for descriptive data.</td>
<td></td>
<td>All psychological variables and demographic variables</td>
<td>Frequency, Mean, Mode, SD, Range</td>
</tr>
<tr>
<td><strong>RQ2:</strong> What are the correlations among the investigated variables that are related to an emergency nurses’ motivation to protect themselves against Ebola infection?</td>
<td></td>
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<tr>
<td><strong>H2.1</strong> Emergency nurses’ psychological variables do not correlate with their protection motivation.</td>
<td>Emergency nurses’ protection motivation</td>
<td>Perceived vulnerability, perceived severity, outcome expectation, self-efficacy, response efficacy, fear, response cost and knowledge</td>
<td>Spearman Rho Correlation &amp; Kruskal-Wallis H Test</td>
</tr>
<tr>
<td><strong>H2.2</strong> Each of the emergency nurses’ psychological variables are significantly correlated with their motivation to protect themselves against Ebola infection.</td>
<td></td>
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<tr>
<td><strong>RQ3:</strong> What are the significant predictors of the United States emergency nurses’ motivation to protect themselves against possible patients with an Ebola infection?</td>
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<tr>
<td><strong>H3.1</strong> None of the emergency nurses’ psychological variables is a significant predictor for their motivation to protect themselves against possible patients with an Ebola infection.</td>
<td>Emergency nurses’ protection motivation</td>
<td>Perceived vulnerability, perceived severity, outcome expectation, self-efficacy, response efficacy, fear, response cost and knowledge</td>
<td>Stepwise Linear Regression</td>
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<tr>
<td><strong>H3.2</strong> Each of the emergency nurses’ psychological variables is a significant predictor for their motivation to protect themselves against possible patients with an Ebola infection.</td>
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<tr>
<td><strong>RQ4:</strong> Does the modified protection motivation model estimate the causal effects among the variables perceived vulnerability, perceived severity, response efficacy, self-efficacy, knowledge, response cost, outcome expectations, fear and protection motivation?</td>
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<tr>
<td><strong>H4.1</strong> No best fit model among these variables</td>
<td>Emergency nurses’ protection motivation</td>
<td>Perceived vulnerability, perceived severity, outcome expectation, self-efficacy, response efficacy, fear, response cost and knowledge</td>
<td>Path Analysis</td>
</tr>
<tr>
<td><strong>H4.2</strong> The model estimates direct and indirect causal effects among the variables.</td>
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**Appendix C: Definition and Sources for the Possible Determinants**

<table>
<thead>
<tr>
<th>Health Behavior Factors</th>
<th>Variable</th>
<th>Variable Source</th>
<th>Country &amp; Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral Factors</td>
<td><strong>Hand washing:</strong> percentage of households in which the place most often used for hand washing was observed.</td>
<td>Data not available</td>
<td>Liberia</td>
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<tr>
<td></td>
<td></td>
<td>(Statistics Sierra Leone et al., 2014)</td>
<td>Sierra Leone, 2013</td>
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<td></td>
<td><strong>Female/male recent sexual activity:</strong> the percentage of women/men between the ages of 15-49 by the timing of the last sexual intercourse.</td>
<td>(Liberia Institute of Statistics and Geo-Information Services (LISGIS) et al., 2014)</td>
<td>Liberia, 2013</td>
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<td></td>
<td>(Statistics Sierra Leone et al., 2014)</td>
<td>Sierra Leone, 2013</td>
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<td></td>
<td><strong>Disposal of children’s stools:</strong> the percent distribution of the youngest children under 5 living with the mother by the manner of disposal of the child’s last fecal matter.</td>
<td>(Liberia Institute of Statistics and Geo-Information Services (LISGIS) et al., 2014)</td>
<td>Liberia, 2013</td>
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<td>(Statistics Sierra Leone et al., 2014)</td>
<td>Sierra Leone, 2013</td>
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<td></td>
<td><strong>Female/male exposure to mass media:</strong> the percentage of women/men between the ages of 15-49 who are exposed to specific media on weekly basis.</td>
<td>(Liberia Institute of Statistics and Geo-Information Services (LISGIS) et al., 2014)</td>
<td>Liberia, 2013</td>
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<td></td>
<td></td>
<td>(Statistics Sierra Leone et al., 2014)</td>
<td>Sierra Leone, 2013</td>
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<td></td>
<td><strong>Female/male employment status:</strong> the percentage of women/men between the ages of 15-49 by their employment status.</td>
<td>(Liberia Institute of Statistics and Geo-Information Services (LISGIS) et al., 2014)</td>
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<td></td>
<td></td>
<td>(Statistics Sierra Leone et al., 2014)</td>
<td>Sierra Leone, 2013</td>
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<tr>
<td>Environmental Factors</td>
<td><strong>Type of sanitation facilities/disposal of human waste:</strong> the percent distribution of household population according to the type of toilet facility used by the household.</td>
<td>(Liberia Institute of Statistics and Geo-Information Services (LISGIS), 2009)</td>
<td>Liberia, 2008</td>
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<td></td>
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<td>(UNICEF &amp; Statistics Sierra Leone, 2011)</td>
<td>Sierra Leone, 2010</td>
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<tr>
<td>Social Factors</td>
<td>Water and soap at place for hand washing</td>
<td>Availability of soap</td>
<td>Total health expenditure</td>
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<td></td>
<td>the percentage of households where place for hand washing was observed and percent distribution of households by availability of water and soap at place for hand washing.</td>
<td>the percent distribution of households by availability of soap in the dwelling.</td>
<td>amount of money made available towards health services.</td>
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<th>Parameter</th>
<th>Description</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest grade completed – high school</td>
<td>The sum of people who indicated high school as their highest grade of completion.</td>
<td>(Liberian Institute of Statistics and Geo-Information Services (LISGIS) &amp; Ministry of Labour, 2011)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Dupigny et al., 2006)</td>
</tr>
<tr>
<td>Highest grade completed – junior high</td>
<td>The sum of people who indicated junior high school as their highest grade of completion.</td>
<td>(Liberian Institute of Statistics and Geo-Information Services (LISGIS) &amp; Ministry of Labour, 2011)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Dupigny et al., 2006)</td>
</tr>
<tr>
<td>Total literacy</td>
<td>The literacy status within the population.</td>
<td>(Liberian Institute of Statistics and Geo-Information Services (LISGIS) &amp; Ministry of Labour, 2011)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(J. A. L. Kamara, 2007)</td>
</tr>
<tr>
<td>Female/male literacy</td>
<td>The distribution of women/men between the age of 15-49 by the level of schooling attended and level of literacy and percentage literate.</td>
<td>(Liberia Institute of Statistics and Geo-Information Services (LISGIS) et al., 2014)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Statistics Sierra Leone et al., 2014)</td>
</tr>
<tr>
<td>Female/male educational attainment</td>
<td>The percentage of distributed women/men aged 15-49 by their highest level of schooling attended or completed and median years completed.</td>
<td>(Liberia Institute of Statistics and Geo-Information Services (LISGIS) et al., 2014)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Statistics Sierra Leone et al., 2014)</td>
</tr>
<tr>
<td>Wealth index</td>
<td>Indicates the level of concentration of wealth, with 0 being equal distribution and 1 a totally unequal distribution.</td>
<td>(Liberia Institute of Statistics and Geo-Information Services (LISGIS) et al., 2014)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Japan International)</td>
</tr>
</tbody>
</table>
| **Number of poor:** the sum of people within the population that are below the poverty line. | Cooperation Agency (JICA) & Mitsubishi UFJ Research and Consulting Co. Ltd., 2011  
(Statistics Sierra Leone et al., 2014) | Sierra Leone, 2013 |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Ministry of Planning and Economic Affairs)</td>
<td>Liberia, 2008</td>
</tr>
<tr>
<td></td>
<td>(Ogbru, 2005)</td>
<td>Nigeria, 2005</td>
</tr>
</tbody>
</table>

**Average household size:** the household population divided by the total households.

<table>
<thead>
<tr>
<th></th>
<th>Liberian Institute of Statistics and Geo-Information Services (LISGIS) &amp; Ministry of Labour, 2011</th>
<th>Liberia, 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(S. M. W. Kamara, 2011)</td>
<td>Sierra Leone, 2004</td>
</tr>
</tbody>
</table>

**Total population size:** sum of a defined population.

<table>
<thead>
<tr>
<th></th>
<th>UNICEF, 2010</th>
<th>Liberia, 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Bangura, 2011)</td>
<td>Sierra Leone, 2011</td>
</tr>
</tbody>
</table>
Appendix D: Adult Research Subject Information Sheet for Focus Group

UT IRB # 200329
ICF Version Date: 12/18/2015
The University of Toledo
Department of Psychology
2801 W. Bancroft St.
Toledo, Ohio 43606
419-530-2717

ADULT RESEARCH SUBJECT INFORMATION SHEET
FOR THE STUDY TITLED

United States Emergency Room Nurses’ Protection Motivation from Contacting Ebola

Principal Investigator: Dr. Jiunn-Jye Sheu, 419-530-4577

Purpose: You are invited to participate in the research project entitled, ‘United States Emergency Room Nurses’ Protection Motivation from Contacting Ebola’, which is being conducted at the University of Toledo under the direction of Dr. Sheu. The purpose of this study is to use a modified Protection Motivation Theory to explore United States emergency room nurses’ protection motivation towards possible patients with Ebola they might have encountered at work.

Description of Procedures: The focus group will take place in a room at the University of Toledo, Medical Center Emergency department. A minimum of 5 to 10 nurses will be included in the group. A draft of the research survey will be given to participants to provide their written feedback about the survey questions.

Potential Risks: There will be minimal risks to participants when participating in the focus group. Such risk included loss confidentiality and might possibly make participants anxious when answering the focus group.

Potential Benefits: Based on the focus group discussion, the nurses will refine the survey questions by removing or including additional questions. The focus group will make sure the questionnaire is tailored to the targeted population; emergency room nurses.

Confidentiality: The researchers will make every effort to prevent anyone who is not on the research team from knowing that you provided this information, or what that information is.

Voluntary Participation: Participation is entirely voluntary. If you decide not to participate, the refusal will involve no penalty or loss of benefits to which you are otherwise entitled and will not affect your relationship with The University of Toledo or the University of Toledo Medical Center. In addition, you may discontinue participation at any time without any penalty or loss of benefits.

Contact Information: Before you decide to accept this invitation to take part in this study, you may ask any questions that you might have. If you have any questions at any time before, during or after your participation, you should contact a member of the research team, Laurasona Leigh at 614-352-8516.

Adult Informed Consent

Page 1 of 2

University of Toledo IRB
Approved
Approval Date: 12/18/2015
Appendix E: IRB Letter

The University of Toledo
Department for Human Research Protections
Biomedical Institutional Review Board
Center for Creative Education Building - Room 0106
3025 Arlington Avenue, Toledo, Ohio 43614-2570
Phone: 419-383-6796  Fax: 419-383-3248
(FWA00010636)

TO: Jiunn-Jye Sheu, Ph.D.
UT Department of Emergency Medicine

FROM: Roland Skeel, M.D., Chair
Boyd Koffman, M.D., Ph.D., Vice Chair
Susan Pocotte, Ph.D., Vice Chair
Steven Pesecki, Ph.D., Vice Chair
Rachel Rarus, PharmD, Chair Designee
UT Biomedical Institutional Review Board

SIGNED: [Signature]

DATE: 4/6/16

SUBJECT: IRB # 209029
TITLE: United States Emergency Room Nurses’ Protection Motivation from Contracting Ebola

The Amendment noted below was reviewed and approved by the Chair or Chair Designee of the University of Toledo Biomedical Institutional Review Board via the expedited mechanism. The Chair or Chair Designee noted that enrollment is closed at this site. This action will be reported to the committee at its meeting on 04/21/2016.

Items included for Review:
• KC Expedited Review of Research Amendment (UT Reference #A002)
  o Add online Survey
  o Revise Survey
  o Revise Cover Letter
  o Revise Postcards
  o Revise Information Sheet
  o Add addition of receiving a $5 Starbucks gift card
  o To add an online survey to the study (assigned version date 04/05/2016)
  o Previous First cover letter (assigned version date 02/26/2016)
  o Revised First cover letter (assigned version date 04/05/2016)
  o Previous Postcards (assigned version date 02/26/2016)
  o Revised Postcards (assigned version date 04/05/2016)
  o Previous Focus Group Survey (assigned version date 02/26/2016)
  o Revised Focus Group Survey (assigned version date 04/05/2016)
  o Previous Information Sheet (assigned version date 02/26/2016)
  o Revised Information Sheet (assigned version date 04/05/2016)

AMENDMENT APPROVAL: 04/05/2016

Please read the following attachment detailing Principal Investigator responsibilities.

IRB Determination Letter  Page 1
Appendix F: Focus Group Summary

On January 11th, 2016, ten Emergency Nurses working at the University of Toledo Medical Center (UTMC) participated in a focus group. The focus group was conducted to gather qualitative data and refine the questionnaire towards the priority population. Two focus groups were conducted: first with five night nurses and the second with day nurses. Each participant was given a copy of the IRB approved questionnaire and the Adult Research Subject Information Sheet. Additionally, questions were asked during the discussion. The researcher stated the purpose of the focus group before the participants reviewed the questionnaire.

The following statements are the participants’ responses after reviewing the questionnaire:

- Participants listed the following improvements to the questionnaire:
  - Having questions relating to the finance.
    - How will the institution protect them and their family if they were quarantined in with Ebola?
    - Will the institution provide medical help for them and their family, especially if they are the sole provider for their family?
    - Will the institution protect their name in the media?
  - Having questions on the spread of the disease to other patients.
    - They were worried about Ebola spreading throughout the facility from patient to patient.
  - Having additional questions on training.
    - Are people aware of the different zones (hot, cold etc)?
    - Proper decontamination method
    - Wearing the protective suit properly and removing the suit properly.
  - Questions on their place of employment having the proper equipment in patient rooms.

- A participant mentioned that nurses should know and do some of the items listed in the questionnaire. For example:
  - Items related to reporting any possible Ebola infections
  - Items related to whether their protective equipment failed

- A participant mentioned that the questionnaire was too long and wordy.
- A participant mentioned that there was limited research on the topic.
- Another participant stated that the word, ‘plastic apron’ in the knowledge section should be changed to ‘isolation gown’.
- Participants stated that overall the questionnaire was very good and addressed the purpose of the research.
Appendix G: Survey Instrument

Office of Institutional Research

Emergency Room Nurses’ Opinions Concerning Ebola Infection

Your opinion is very important and valuable to this research study. The information will benefit nurses who might give care to possible patients with Ebola that they encounter in the emergency room. The study will examine what motivates nurses to protect themselves if they have to care for a patient who is infected with Ebola. By knowing these factors, nurses may be better able to care for these patients and themselves.

This brief survey will take about 15 minutes of your time. Upon completion, you will enter your email address to receive a $5 Starbucks gift card. This study is completely voluntary and strict confidentiality will be maintained at all time. This research has been approved by the University of Toledo IRB and it does not represent nor is it sponsored by the Emergency Nurses’ Association.

Completion of this survey implies consent. If you have any questions, comments or suggestions, please email me at Laurasona.Leigh@utoledo.edu.

Thank you in advance for your input and support of nursing research.
Survey Instrument (continued)

Office of Institutional Research

**Directions:**

Please check the box that best represents your opinion in each section. Your responses will remain confidential and the information received will be reported only as group data.

Please rate the following that best represents your opinion.

If you give care to a patient with the Ebola infection, how likely would the following happen to you?

<table>
<thead>
<tr>
<th></th>
<th>Not At All</th>
<th>Somewhat Likely</th>
<th>Moderately Likely</th>
<th>Quite Likely</th>
<th>Extremely Likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Getting infected with Ebola</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unknowingly spreading Ebola to my family members</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unknowingly spreading Ebola to my friends</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unknowingly spreading Ebola to another patient</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unknowingly spreading Ebola to co-workers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dying from Ebola</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Survey Instrument (continued)

Office of Institutional Research

Please rate the following that best represents your opinion.

How do you rate the seriousness of the following, if it occurred to you?

<table>
<thead>
<tr>
<th></th>
<th>Not Serious</th>
<th>Somewhat Serious</th>
<th>Moderately Serious</th>
<th>Quite Serious</th>
<th>Extremely Serious</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitalized due to Ebola.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Losing your job due to an Ebola infection.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Being quarantined after exposure to Ebola.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spreading Ebola to my family members.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spreading Ebola to my friends.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spreading Ebola to other patients.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spreading Ebola to other co-workers.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please rate the following that best represents your opinion.

How effective is each of the following in controlling Ebola infection?

<table>
<thead>
<tr>
<th></th>
<th>Not Effective</th>
<th>Somewhat Effective</th>
<th>Moderately Effective</th>
<th>Quite Effective</th>
<th>Extremely Effective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correctly washing my hands before and after each patient interaction.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correctly wearing and removing personal protective equipment (i.e. scrub suits, mask, gloves, isolation gown, face shield and head cover).</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correctly disinfecting areas used by a patient who show signs of Ebola infection.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attending Ebola infection control training.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Survey Instrument (continued)**

**Office of Institutional Research**

<table>
<thead>
<tr>
<th>Please rate the following that best represents your opinion.</th>
<th>Not Confident</th>
<th>Somewhat Confident</th>
<th>Moderately Confident</th>
<th>Quite Confident</th>
<th>Extremely Confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>How confident are you in your ability to?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Properly wash my hands before and after each patient interaction.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Properly wear and remove personal protective equipment (i.e. scrub suits, mask, gloves, isolation gown, face shield and head cover).</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Properly disinfect areas used by a patient who shows signs of Ebola infection.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Properly implement Ebola infection control.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correctly triage a patient.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Please rate the following that best represents your opinion.**

**If you had to provide care to a patient with the Ebola infection, how concerned are you with the following?**

<table>
<thead>
<tr>
<th>Not Concerned</th>
<th>Somewhat Concerned</th>
<th>Moderately Concerned</th>
<th>Quite Concerned</th>
<th>Extremely Concerned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquiring Ebola.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposing my family to Ebola.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposing another patient to Ebola.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dying from Ebola.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unable to fulfill my family obligations.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss of income.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Being quarantined.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Survey Instrument (continued)

Office of Institutional Research

Please rate the following that best represents your opinion.

To what extent would the following complicate your life, when you give care to a possible patient with Ebola?

<table>
<thead>
<tr>
<th></th>
<th>Not At All</th>
<th>Somewhat Likely</th>
<th>Moderately Likely</th>
<th>Quite Likely</th>
<th>Extremely Likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Being required to work longer hours.</td>
<td></td>
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</tr>
<tr>
<td>Being infected with Ebola would increase my medical expenses.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Being unable to arrange childcare or care for others who depend on me.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Being quarantined would prevent me from fulfilling family obligations.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Being infected with Ebola would keep me away from friends and family.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please rate the following that best represents your opinion.

If I am confronted with a situation where a patient might have the Ebola infection, how likely am I to do the following?

<table>
<thead>
<tr>
<th></th>
<th>Not At All</th>
<th>Somewhat Likely</th>
<th>Moderately Likely</th>
<th>Quite Likely</th>
<th>Extremely Likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wash my hands before and after each patient interaction.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wear personal protective equipment (i.e. scrub suit, mask, gloves, isolation gown, face shield and head cover) with each patient interaction.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoid coming to work to reduce my family's exposure to Ebola infection.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attend Ebola infection control training.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disinfect areas used by the patient.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Survey Instrument (continued)

Office of Institutional Research

Please rate the following that best represents your opinion.

If you are infected with Ebola because you did not correctly wash your hands before and after taking care of a patient with Ebola and improperly wear personal protective equipment, how likely could the following occur?

<table>
<thead>
<tr>
<th>Event</th>
<th>Not At All</th>
<th>Somewhat Likely</th>
<th>Moderately Likely</th>
<th>Quite Likely</th>
<th>Extremely Likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Become seriously ill from an Ebola infection.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infect my family with Ebola.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infect my friends with Ebola.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infect another patient with Ebola.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Die from an Ebola infection.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Be placed on medical leave for an extended period.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ebola infection is a disease of:

- Viral origin
- Fungal origin
- Bacterial origin
- Don't know

The natural host of the Ebola organism is:

- Mosquitoes
- Rat
- Fruit bats
- Honey bee
- Don't know
Human-to-human transmission of Ebola infection occurs:
- A. By contact with a patient’s blood and bodily fluids
- B. By contact with contaminated items used for patient care
- Both a and b
- Don’t know

The signs and symptoms of Ebola infection include:
- Fever
- Intense weakness
- Muscle pain
- Internal and external bleeding
- All of the above
- Don’t know

The recommended methods for healthcare providers of Ebola infection are:
- Isolation
- Personal protective equipment (i.e. Scrub suit, rubber boots, gloves, mask, head cover, face shield, and isolation gowns)
- Hand washing with soap
- Sterilization of equipment
- All of the above
- Don’t know
Which of the following is the correct order of putting on personal protective equipment before entering an isolation room with a possible patient with the Ebola infection:

- Scrub suit, rubber boots, two pairs of gloves, gown or coverall, mask, head cover, face shield or goggles, gloves and isolation gown.
- Scrub suit, rubber boots, first pair of gloves, gown or coverall, mask, head cover, face shield or goggles, second pair of gloves and isolation gown.
- Scrub suit, rubber boots, gown or coverall, mask, head cover, face shield or goggles, two pair of gloves and isolation gown.
- Don’t know

**Directions:** Please mark the answer that best describes your opinion for each question.

<table>
<thead>
<tr>
<th>Statement</th>
<th>True</th>
<th>False</th>
<th>Unsure</th>
</tr>
</thead>
<tbody>
<tr>
<td>The maximum incubation period of Ebola is 42 days.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ebola is secreted in breast milk and can potentially infect breastfed babies.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heavily soiled linen from a patient with Ebola infection should be sorted in the patient care area before further processing.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A person who died from an Ebola infection can be embalmed.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The single most important practice for reducing the transmission of Ebola infection within a health care facility is hand hygiene.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5% chlorine solution is a recommended disinfectant for cleaning Ebola infection in the patient areas.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A patient who died from an Ebola infection should be handed over to relatives for immediate burial.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Demographics and Background Characteristics of Respondents

**Directions:** Please check the appropriate category.

**What gender do you identify with?**
- Male
- Female
- Other:

**What year were you born?**

**What race do you identify with?**
- African American
- Alaska Native
- Caucasian
- American Indian
- Asian or Pacific Islander
- Two or more races
Survey Instrument (continued)

Office of Institutional Research

What is your highest degree in nursing?
- Diploma
- Associate’s Degree
- Bachelor’s Degree
- Master’s Degree
- Doctoral Degree

What is your current level of licensure? (Check all that apply)
- LPN/I VN
- Nurse Practitioner
- Registered Nurse
- Clinical Nurse Specialist

How many hours per week do you provide direct care to patients in an emergency room?
Hours: ___________

How many years have you practiced as an emergency nurse?
Years: ___________

In what setting is your place of employment?
- Urban (in the city)
- Suburban (residential area bordering a city)
- Rural (outside the city)
Survey Instrument (continued)

Office of Institutional Research

<table>
<thead>
<tr>
<th>Have you ever received any training on controlling the Ebola infection?</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ No</td>
</tr>
<tr>
<td>○ Yes, how many hours</td>
</tr>
<tr>
<td>○ Not sure</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Have you ever received any training at your place of employment on controlling the Ebola infection?</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
</tr>
<tr>
<td>Yes, how many hours</td>
</tr>
<tr>
<td>Not sure</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Does your place of employment have any accommodation to give care to a possible patient with Ebola?</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>Not sure</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Does your place of employment have the necessary equipment to give care to a possible patient with Ebola?</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>Not sure</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Do you feel prepared to give care to a possible patient with Ebola?</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>Not sure</td>
</tr>
</tbody>
</table>
Survey Instrument (continued)

Office of Institutional Research

Where have you received the majority of your knowledge about the Ebola infection? (select all that apply)

- Course work while attending school
- On the job training
- Workshop/Conference
- Professional journals/trade magazines
- Newspaper and/or magazines
- Professional organization
- Television
- Pamphlets
- Internet
- Newsletters
- Peers
- Social media
- Other (please specify)

Your assistance with this study was greatly appreciated. Thank you for completing this survey!! Please enter your name and email address to receive a $5 Starbucks gift card.

All responses will be reported as group data, and no individual participant’s data will be identifiable.

Email address: 
First Name: 
Last Name: 

We thank you for your time spent taking this survey.  
Your response has been recorded.
Appendix H: Expert Panel Reviewers

Survey Research

Joseph A. Dake, Ph.D, MPH, FASHA
Professor and Chair
Department of Health and Recreation Professions
College of Health Sciences
University of Toledo
Mail Stop #119, HH 1000C
2801 W. Bancroft Street
Toledo, Ohio 43606
Joseph.Dake@utoledo.edu
419-530-4759

Content Area

Joan Duggan, M.D.
Professor, Chief, Infectious Diseases and Director, Ryan White HIV Center
Department of Medicine
University of Toledo, Health Science Campus
Mail Stop #1185, RHC 0007
3000 Arlington Ave.
Toledo, Ohio 43614
Joan.Duggan@utoledo.edu
419-383-4328

Brian Fink, PhD, MPH, CHES
Associate Professor
Department of Public Health and Preventive Medicine
University of Toledo, Health Science Campus
Mail Stop # 1027, COB 4223
3000 Arlington Ave.
Toledo, Ohio 43614
Brian.Fink@utoledo.edu
419-383-4817
Appendix I: Cover Letter: Panel of Experts

January 21st, 2016

Joseph A. Dake, Ph.D., MPH, FASHA
Professor and Chair, Department of Health and Recreation Professions
University of Toledo
Toledo, Ohio 43606

Dear Dr. Dake:

Thank you for agreeing to review the questionnaire for the dissertation entitled, “Ebola: Behavioral & Environmental Attributes in West Africa and United States Emergency Room Nurses’ Protection Motivation”. A modified Protection Motivation Theory is used to guide the questionnaire in determining the United States Emergency Room Nurses’ protection motivation towards possible patients with Ebola they might have encountered at work.

The questionnaire was developed utilizing the Protection Motivation Theory constructs for the following items: perceived vulnerability – item 1; perceived severity – item 2; response efficacy – item 3; self-efficacy – item 4; fear – item 5; response cost – item 6; protection motivation – item 7 and intrinsic & extrinsic rewards – item 8.

I hope you can provide feedback about the design and survey items in the instrument. More specifically, mark on the questionnaire: (1) Any changes needed in wording, (2) Any comments or suggestions to improve an item, (3) Lines through items that are not needed and (4) Any additional items that you perceive are needed.

Your expert opinion is critical to the success of this study. Your response within the next week would be greatly appreciated. Thank you again for taking the time to review this questionnaire and provide constructive feedback.

Sincerely,

Laurasona Leigh
Appendix J: Cover Letter: Test Re-test Letter One

Dear Nurse,

My name is Laurasona Leigh and I am working on a doctoral degree in Health Education at the University. To complete my degree, I am doing a research study that is looking at what motivates nurses to protect themselves when taking care of a patient who may be infected with Ebola. I am requesting your assistance with this research study. One requirement for this research is to assess the accuracy of the questionnaire. The assessment involves having the questionnaire completed twice by a small group of emergency room nurses. This will involve 10-15 minutes of your time to complete the survey on two separate occasions.

To ensure anonymity, I will match your first and second responses by using a specific code on the top of the first page. TO CODE: PLEASE PUT THE FIRST 4 NUMBERS OF YOUR HOME STREET ADDRESS IN THE SPACE PROVIDED. In the case where there is only one number, for example 3 Bancroft St., USE ZEROS TO COMPLETE THE EMPTY SPACES. If you live at 3 Bancroft St. the code would be 3000. If you live at 313 W. Third St., the code entered would be 3130.

Strict confidentiality will be maintained at all times. Only research team members will have access to the raw data. All responses will be reported as group data and no individual participant’s data will be identifiable. The results from both questionnaires will be used for reliability testing purposes only and will be permanently deleted from my database upon completion. Attached is the survey for you to complete. I will give you the exact survey to complete again one week after you complete the first survey.

This letter is not a consent form, it just tells you about my study. Completing the survey will be taken as your implied consent to take part in this study. If you wish to participate, please complete the survey. If you have any questions, comments or suggestions, please call 614-352-8516 (cell) or email me at Laurasona.Leh@gmail.edu

Thank you for your professional courtesy.

Sincerely,

Laurasona Leigh, MPH
Ph.D. Student
Department of Health and Recreation Professions
University of Toledo
2801 W. Bancroft Street
Toledo, Ohio 43606

UT IRD# 200929
Assigned Version Date: 02/26/2016
Appendix K: Cover Letter: Test Re-test Letter Two

Dear Nurse,

Recently, you completed a survey for a research that looks at what motivates you to protect yourself if you give care to a possible patient with Ebola. As outlined in the previous letter, this is the second half of the reliability testing for this study.

Once again, thank you very much for agreeing to participate in testing the questionnaire. If you have any questions, comments or suggestions, please call 614-352-8516 (cell) or email me at Laurasona.leigh@utoledo.edu.

Thank you for your professional courtesy.

Sincerely,

Laurasona Leigh, MPH
Ph.D. Student
Department of Health and Recreation Professions
University of Toledo
2801 W. Bancroft Street
Toledo, Ohio 43606
Appendix L: Test Re-test Summary

After the IRB protocol was approved, a pilot study was conducted using a convenience sample of Emergency Room Nurses at the University of Toledo Medical Center (UTMC). The goal of the study was to assess the stability and internal consistency reliability of the survey instrument. Nurses working the night and morning shifts were given an instructional cover letter, the questionnaire and an incentive (breakfast). Due to different nurse schedules, the pre-test was administered to more than one group of nurses during the first week of the pilot study. Nurses that completed the pre-test in the first week completed the survey again one week after. Some completed the post-test two weeks after due to their work schedule.

A total of 23 Emergency Room Nurses completed the questionnaire twice with one to two weeks apart between the pre- and post-test. Internal consistency reliability was calculated for each pre- and post-test survey constructs. Cronbach’s alpha was used to analyze Likert-type scales and the coefficients range between 0.468 and 0.971. Six out of eight survey constructs had an alpha of 0.80 or greater. Items under protection motivation had a low alpha (0.495).

Spearman Rho Correlation was conducted to assess the stability of each survey construct at two different points in time. The significance level for each construct’s correlation coefficient was examined to determine whether the items should be modified or removed from the instrument. Based on the findings, two items were removed: one from the fear construct (Interacting with the media) and the other from the protection motivation construct (Avoid entering patient rooms that are labeled ‘isolation’ that are not assigned to me) after discussion with the Dissertation Committee Chair. Based on the feedback from the participating nurses, examples of personal protective equipment were listed in the response efficacy and self-efficacy items to provide additional clarification to the participant.

The question for the outcome expectation construct was modified to fit the items and clearly outline what could occur if nurses do not take the necessary precautions. The questions for response cost were changed to exclude items that focused on the nurse’s job requirement including reporting to their supervisor and completing infectious control training. The changes to the response cost items were due to low Cronbach’s alpha and test-retest coefficients. The items for response cost were changed to focus on the types of personal cost the nurse will have to give up if they give care to a possible patient with Ebola. Refer to the table below for a complete list of the Cronbach’s alphas and correlation coefficient from the pilot study.
## Appendix M: Internal and Stability Reliability Scores for the Instrument

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Items before survey modification</th>
<th>Pre-test Internal Reliability (Cronbach’s Alpha)</th>
<th>Post-test Internal Reliability (Cronbach’s Alpha)</th>
<th>Stability Reliability (Spearman Rho Correlation)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Perceived Vulnerability</strong></td>
<td>Getting infected with Ebola.</td>
<td>.951</td>
<td>.971</td>
<td>.605**</td>
</tr>
<tr>
<td></td>
<td>Unknowingly spreading Ebola to my family members.</td>
<td></td>
<td></td>
<td>.558**</td>
</tr>
<tr>
<td></td>
<td>Unknowingly spreading Ebola to my friends.</td>
<td></td>
<td></td>
<td>.644**</td>
</tr>
<tr>
<td></td>
<td>Unknowingly spreading Ebola to another patient.</td>
<td></td>
<td></td>
<td>.715**</td>
</tr>
<tr>
<td></td>
<td>Unknowingly spreading Ebola to my co-workers.</td>
<td></td>
<td></td>
<td>.608**</td>
</tr>
<tr>
<td></td>
<td>Dying from Ebola.</td>
<td></td>
<td></td>
<td>.548**</td>
</tr>
<tr>
<td><strong>Perceived Severity</strong></td>
<td>Hospitalized due to Ebola.</td>
<td>.968</td>
<td>.945</td>
<td>.658**</td>
</tr>
<tr>
<td></td>
<td>Losing your job due to an Ebola infection.</td>
<td></td>
<td></td>
<td>.794**</td>
</tr>
<tr>
<td></td>
<td>Being quarantined after exposure to Ebola.</td>
<td></td>
<td></td>
<td>.410</td>
</tr>
<tr>
<td></td>
<td>Spreading Ebola to my family members.</td>
<td></td>
<td></td>
<td>.536**</td>
</tr>
<tr>
<td></td>
<td>Spreading Ebola to my friends.</td>
<td></td>
<td></td>
<td>.664**</td>
</tr>
<tr>
<td></td>
<td>Spreading Ebola to other patients.</td>
<td></td>
<td></td>
<td>.580**</td>
</tr>
<tr>
<td></td>
<td>Spreading Ebola to other co-workers.</td>
<td></td>
<td></td>
<td>.633**</td>
</tr>
<tr>
<td><strong>Response Efficacy</strong></td>
<td>Correctly washing my hands before and after each patient interaction.</td>
<td>.788</td>
<td>.875</td>
<td>.409</td>
</tr>
<tr>
<td></td>
<td>Correctly wearing and removing personal protective equipment.</td>
<td></td>
<td></td>
<td>.170</td>
</tr>
<tr>
<td></td>
<td>Correctly disinfecting areas used by a patient who show signs of Ebola infection.</td>
<td></td>
<td></td>
<td>.290</td>
</tr>
<tr>
<td></td>
<td>Attending Ebola infection control training.</td>
<td></td>
<td></td>
<td>.638**</td>
</tr>
<tr>
<td><strong>Self-Efficacy</strong></td>
<td>Properly wash my hands before and after each patient interaction.</td>
<td>.775</td>
<td>.901</td>
<td>.335</td>
</tr>
<tr>
<td></td>
<td>Properly wear and remove personal protective equipment.</td>
<td></td>
<td></td>
<td>.740**</td>
</tr>
<tr>
<td></td>
<td>Properly disinfect areas used by a patient who show signs of Ebola infection.</td>
<td></td>
<td></td>
<td>.532**</td>
</tr>
<tr>
<td></td>
<td>Properly implement Ebola infection control.</td>
<td></td>
<td></td>
<td>.524*</td>
</tr>
<tr>
<td></td>
<td>Correctly triage a patient.</td>
<td></td>
<td></td>
<td>.405</td>
</tr>
<tr>
<td><strong>Fear</strong></td>
<td>Acquiring Ebola.</td>
<td>.932</td>
<td>.888</td>
<td>.615**</td>
</tr>
<tr>
<td></td>
<td>Exposing my family to Ebola.</td>
<td></td>
<td></td>
<td>.569**</td>
</tr>
<tr>
<td></td>
<td>Exposing another patient to Ebola.</td>
<td></td>
<td></td>
<td>.580**</td>
</tr>
<tr>
<td></td>
<td>Dying from Ebola.</td>
<td></td>
<td></td>
<td>.645**</td>
</tr>
<tr>
<td></td>
<td>Unable to fulfill my family obligations.</td>
<td></td>
<td></td>
<td>.487*</td>
</tr>
<tr>
<td></td>
<td>Loss of income.</td>
<td></td>
<td></td>
<td>.494*</td>
</tr>
<tr>
<td></td>
<td>Interacting with the media.</td>
<td></td>
<td></td>
<td>.232</td>
</tr>
<tr>
<td><strong>Response Cost</strong></td>
<td><strong>Outcome Expectations</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>--------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Being quarantined.</td>
<td>.540**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Washing my hands correctly before and after every patient interaction is a hassle.</td>
<td></td>
<td>.796</td>
<td>.741</td>
<td>.001</td>
</tr>
<tr>
<td>Properly wear personal protective equipment before interacting with a patient who may be infected is a hassle.</td>
<td></td>
<td></td>
<td>.116</td>
<td></td>
</tr>
<tr>
<td>Being trained on infection control requires considerable time and effort.</td>
<td></td>
<td></td>
<td>.027</td>
<td></td>
</tr>
<tr>
<td>Reporting to my supervisor if I became exposed would cause me a lot of stress.</td>
<td></td>
<td></td>
<td>-.068</td>
<td></td>
</tr>
<tr>
<td>Completing the necessary paper work if I become exposed requires considerable time and effort.</td>
<td></td>
<td></td>
<td>-.073</td>
<td></td>
</tr>
<tr>
<td>Being quarantined would prevent me from fulfilling family obligations.</td>
<td></td>
<td></td>
<td>.529**</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Protection Motivation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wash my hands before and after each patient interaction.</td>
<td></td>
<td>.495</td>
<td>.468</td>
<td>.465*</td>
</tr>
<tr>
<td>Wear personal protective equipment with each interaction with a patient who might be infected.</td>
<td></td>
<td></td>
<td>.465*</td>
<td></td>
</tr>
<tr>
<td>Avoid entering patient rooms that are labeled ‘Isolation’ that are not assigned to me.</td>
<td></td>
<td></td>
<td>.104</td>
<td></td>
</tr>
<tr>
<td>Avoid coming to work to reduce my family’s exposure to Ebola infection.</td>
<td></td>
<td></td>
<td>.575**</td>
<td></td>
</tr>
<tr>
<td>Attend Ebola infection control training.</td>
<td></td>
<td></td>
<td>.544*</td>
<td></td>
</tr>
<tr>
<td>Disinfect areas used by the patient.</td>
<td></td>
<td></td>
<td>.489*</td>
<td></td>
</tr>
<tr>
<td>Become seriously ill from an Ebola infection.</td>
<td></td>
<td>.950</td>
<td>.968</td>
<td>.385</td>
</tr>
<tr>
<td>Infect my family with Ebola.</td>
<td></td>
<td></td>
<td>.422*</td>
<td></td>
</tr>
<tr>
<td>Infect my friends with Ebola.</td>
<td></td>
<td></td>
<td>.602**</td>
<td></td>
</tr>
<tr>
<td>Infect another patient with Ebola.</td>
<td></td>
<td></td>
<td>.308</td>
<td></td>
</tr>
<tr>
<td>Die from an Ebola infection.</td>
<td></td>
<td></td>
<td>.611**</td>
<td></td>
</tr>
<tr>
<td>Be placed on medical leave for an extended period.</td>
<td></td>
<td></td>
<td>.322</td>
<td></td>
</tr>
</tbody>
</table>

*p<0.01; *p<0.05
Appendix N: Cover Letter: Study Participants

Dear [First name] [Last name],

My name is Laurasona Leigh and I am working on a doctoral degree in Health Education at the University of Toledo. To complete my degree, I am doing a research study that is looking at what motivates nurses to protect themselves if they have to care for a patient who is infected with Ebola. By knowing these factors, nurses may be better able to care for these patients and themselves. You are being asked to take part in this study because you are a member of a national nursing organization that is dedicated to emergency nursing. Your name and address was obtained from the Emergency Nurses Association.

Your opinion in this study is very important and valuable as it helps us to better understand what motivates Emergency Room Nurses across the country to protect themselves when caring for patients who may be infected with Ebola. If you wish to participate in the study, please use this link: http://bit.ly/25mhF0d to complete the online survey and receive a $5 Starbucks gift card upon completion. This brief survey will take about 15 minutes of your time to complete, which you can do at your earliest convenience. No other monetary or other compensation is being offered to anyone who participates in this study.

The survey is completely voluntary and you may refuse to participate in this survey without jeopardizing any relationships with your co-workers, employers or organizations in which you have memberships. This research does not represent and is not sponsored by the Emergency Nurses’ Association. If you wish to participate in this study, please complete the online survey. I will be sending a reminder postcard in about two weeks.

Your participation in this survey should result in minimal or no risk to you. It is possible, but highly unlikely that you could have some mental stress because of reading and answering the survey. Any knowledge gained from the study may not directly benefit you. It is hoped, however, that the information will benefit nurses who might give care to possible patients with Ebola that they encounter in the emergency room.

Strict confidentiality will be maintained at all times. Only research team members will have access to the raw data. No one will know who has or has not responded to this survey. All responses will be reported as group data and no individual participant’s data will be identifiable. This letter is not a consent form, it just tells you about the study. Completing the survey will be taken as your implied consent to take part in this study.

If you wish to participate, please complete and return the enclosed survey. If you have any questions, comments or suggestions, please call 614-352-8516 (cell) or email at Laurasona.Leigh@utoledo.edu

Thank you in advance for your input and support of nursing research.

Sincerely,

Laurasona Leigh MPH
Ph.D. Student
Department of Health & Recreation Professions

Katie Bush
ENA Member
Clinical Simulation & Education Research Account
Department of Advanced Clinical Simulation

Colleen Taylor, Ph.D. RN, FNP-BC
Assistant Professor
College of Nursing

UT IRB# 200929
Assigned version Date: 04/05/2016

APPROVED BY
UNIVERSITY OF TOLEDO IRB

144
Appendix O: Adult Research Subject Information Sheet for Survey

UT IRB #: 2009-29
ICF Version Date: 04/08/2016
The University of Toledo
Department of Psychology
2801 W. Bancroft St.
Toledo, Ohio 43606
419-530-2717

ADULT RESEARCH SUBJECT INFORMATION SHEET
FOR THE STUDY TITLED

United States Emergency Room Nurses’ Protection Motivation from Contracting Ebola

Principal Investigator: Dr. Jiunn-yee Shyu, 419-530-4577

Purpose: You are invited to participate in the research project entitled, ‘United States Emergency Room Nurses’ Protection Motivation from Contracting Ebola’, which is being conducted at the University of Toledo under the direction of Dr. Shyu. The purpose of this study is to use a modified Protection Motivation Theory to explore United States emergency room nurses’ protection motivation towards possible patients with Ebola they might have encountered at work.

Description of Procedures: A cover letter will be mailed to each participant. Each letter will be personalized using the UT letterhead and addressed to each participant. Each personalized letter will outline the purpose of the study, provide a link to the online survey, ensure confidentiality, provide contact information and signed personally by an individual in the nursing field and a member of the Emergency Nurses’ Association. At the end of the survey, the participant will provide their email address and name. The email address will be used to send each participant that completed the survey a $5 Starbucks gift card. The names are needed so the researcher is made aware of who submitted the survey and who has not, so the researcher only sends postcard reminders to non-responders.

Potential Risks: There are minimal risks in participating in this research study, including possible loss of confidentiality. Other possible risks include feeling upset or anxious while answering the questionnaire.

Potential Benefits: The questionnaire responses will evaluate and generalize the motivation emergency room nurses have in protecting themselves when giving care to possible patients with Ebola.

Confidentiality: The researchers will make every effort to prevent anyone who is not on the research team from knowing that you provided this information, or what that information is.

Voluntary Participation: Participation is entirely voluntary. If you decide not to participate, the refusal will involve no penalty or loss of benefits to which you are otherwise entitled and will not affect your relationship with The University of Toledo or the University of Toledo Medical Center. In addition, you may discontinue participation at any time without any penalty or loss of benefits.

Contact Information: Before you decide to accept this invitation to take part in this study, you may ask any questions that you might have. If you have any questions at any time before, during or after your participation, you should contact a member of the research team, Laurasena Leigh at 614-352-8516. If you have questions beyond those answered by the research team or your rights as a research subject or research-related injuries, the Chairperson of the Biomedical Institutional Review Board may be contacted by calling (419) 383-6796.
Appendix P: Postcard

Dear [First name] [Last name],

Recently, you received a letter with a link to an online survey. The letter informed you about the study that looks at what motivates you to protect yourself if you give care to a possible patient with Ebola. Your opinion on what you regard as your motivation to protect yourself while caring for a patient who might be infected with the Ebola virus is very important and valuable to us. You are being asked to take part in this study because you are a member of a national nursing organization that is dedicated to emergency nursing. Your name and address was obtained from the Emergency Nurses’ Association.

This postcard is to remind you to complete the online survey. This research does not represent and is not sponsored by the Emergency Nurses’ Association. I would like to remind you that all your responses are confidential and participation is voluntary. If you have completed the online survey, thank you very much and please disregard this postcard. If not, I would greatly appreciate it if you would do so.

For your convenience, I have included the link http://bit.ly/25mhF0d to complete the online survey and receive a $5 Starbucks gift card upon completion. Your assistance with this research study is greatly appreciated.

Thank you in advance for your input and support of nursing research.

Sincerely,

Laurasone Leigh, MPH
Ph.D. Student
Department of Health & Recreation Professions
University of Toledo

Katie Bush
ENA Member
Clinical Simulation & Education

Colleen Taylor, Ph.D, RN, FNP-BC
Assistant Professor
College of Nursing
University of Toledo

Research Associate
Department of Advanced Clinical Simulation
University of Toledo