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Information Risk Communication in the Context of Zika Virus: A Pilot Study

Emergent Research Forum

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Abstract

Dissemination of information to at-risk populations is essential in any emergency situation. Among many health emergencies, Zika virus is a large-scale health challenge that requires authorities to communicate the risks of the virus, and, potential protective measures to the population. Communication technologies have an important role to play in this effort. Other factors, such as hazard characteristics and warning fatigue, also influence the effectiveness of communication. This article develops an adaptation of the Protective Action Decision Making (PADM) model for a holistic understanding of the technical and non-technical factors that influence the responses of vulnerable individuals to information about the Zika virus. Investigation of antecedents to vulnerable stakeholders' response will contribute to the growing literature on information risk communication and emergency responses to potential epidemics.

Keywords: public health, Zika virus, emergency response, protective action decision making (PADM), threat perception, information risk perception, warning fatigue, access channels

Introduction

Communication technologies are at the heart of getting the information about epidemics to the population. According to Selwyn et al. (2003), information and communication technologies (ICTs) are considered important communication channels enabling people to enhance social support and promote access to learning, information, communication, and social activities. Research in information systems literature demonstrates that organizations can design risk communication messages to improve computer security proactively (Wang, Xiao, & Rao 2015). Once the message has been received, individuals must take protective actions.

There are various theories explaining individual motivations to take protective actions introducing different cognitive factors. Among these, the protective action decision model (PADM) (Lindell & Perry 2012) is one that has been used to study health and hazard behavior issues. Drawing on the PADM model our research adopts a holistic approach (as opposed to a technology-centric approach) to examine effective means of risk communication. In the following sections, we discuss theoretical background, and develop hypotheses. A theoretical model that explores factors influencing people to take protective actions against Zika virus is presented. Pilot data gathering and analysis are reported, followed by a conclusion.

Theoretical Background and Hypotheses

Our study uses an adapted version of Protective Action Decision Model (PADM) a multistage model. Stage theories are being used increasingly to investigate health-protective behaviors (Weinstein et al. 1998). The premise of our model is that threat perception influences behavioral responses. In turn, access channel characteristics and hazard characteristics influence threat perception. The relationship between hazard characteristics and threat perception is moderated by warning fatigue. The rationale for these is provided below.

Access Channel Characteristics

Information about Zika is disseminated through many channels: television, radio, newspapers, magazine, health brochures, social media, and so on. It is argued that once believable information is received, the threat of Zika will be readily accepted. In order to measure access channel characteristics, we created a second order formative construct by combining expertise and strength of the channel in conveying the message. Thus, we believe that the expertise and strength of the channel to convey the message will influence threat perception. Based on these arguments, it is hypothesized:

H1: There is a positive relationship between access channel characteristics (expertise and strength in message conveyance) and threat perception.

Hazard characteristics

Hazard characteristics include hazard severity, which is the belief about the magnitude or significance of the threat and the magnitude of its consequences, and hazard susceptibility, which is the likelihood of hazard occurrence and belief about the probability of personally experiencing the threat. These two dimensions together determine the extent of perceived threat (Witte 1992). When individuals believe that they are vulnerable to Zika virus and that the consequence of being infected is severe, perceived threat of the virus will result. Consequently, we hypothesize that:

H2: There is a positive relationship between familiarity with hazard characteristics and the level of perceived threat.

Warning fatigue

Warning fatigue (also referred to as the cry-wolf effect) can result from being over-warned. When individuals are exposed to frequent warning messages about a disaster, they get tired of hearing the warnings, and become apathetic. Mackie (2014). Atwood and Major (1998) showed that after sending many messages, people spent less time thinking about and preparing for the threat. While the characteristic of the disaster itself identifies the level of threat perception (Turner 1978), warning fatigue can influence how the public perceive the threat, interpret and respond to uncertain disasters (Mackie 2014). Therefore, we hypothesize that:

H3: The relationship between hazard characteristics and threat perception is weakened due to warning fatigue.

Threat Perception and Behavioral Response

Threat perception produces behavioral responses (Lindell & Perry 2012). Researchers have found a positive relationship between threat perceptions and behavioral response, in a wide variety of catastrophc events including floods (Perry, Lindell, & Greene 1981), earthquakes (Blanchard-Boehm 1998), hurricanes (Baker 1991), and volcanic eruptions (Perry & Greene 1983). Four types of behavioral responses are the focus of this research: information search, protective action, task-focused coping, emotion-focused coping and avoidance coping. Information search, which is an information seeking behavior, is a stage in which a consumer searches for information (Zhu, Wei and Zhao 2016) in order to decrease uncertainty and doubt.

Based on coping literature on cognitively demanding tasks (Matthews & Campbell 1998; Wang et al. 2015), three common coping responses are identified as task-focused coping, emotion-focused coping, and avoidance. The three coping responses are co-exist (Popova 2012). Coping plays an important role in individuals' responses to environment (Matthews et al. 2002, 2006; Matthews & Campbell 1998). Therefore, analyzing coping mechanisms help to improve people's safety and health. Task-focused coping is equal to protective actions in this research (Matthews and Campbell 1998). Emotion-focused coping describes attempts to deal with issues by either positive thinking or self-criticism (Matthews and Campbell 1998). Avoidance coping refers to the engagement in behaviors unrelated to the problem (Matthews and Campbell 1998). Simply said, people are engaged in avoidance coping mechanisms when

they stop making effort in taking protective actions and divert their attention. In accordance with previous studies, we hypothesize that:

H4: There is a positive relationship between threat perception and behavioral responses.

Figure 1 presents conceptual model based on four research hypotheses developed.

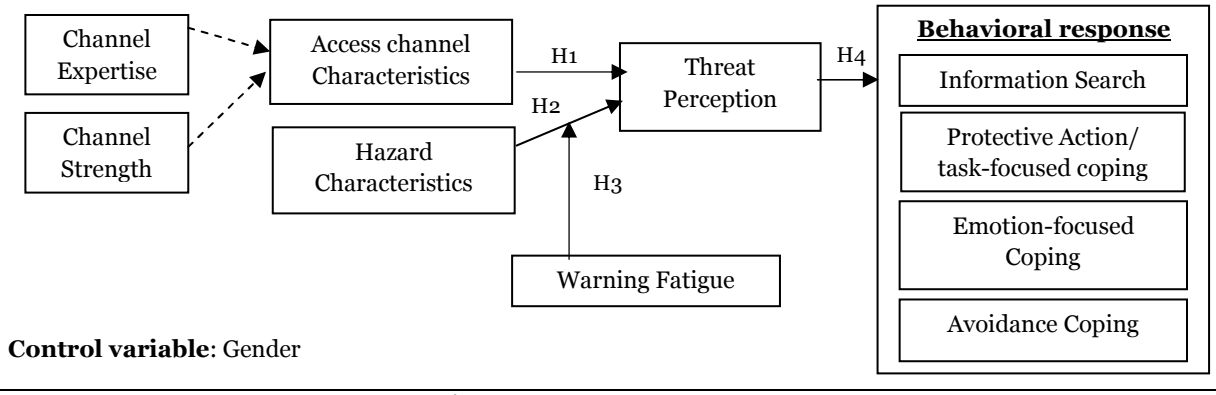

Figure 1. Research Model

Pilot Data Collection and Analysis

Pilot data were gathered using the survey methodology to test the instruments and the research model. Data gathering was done in Texas which has the third largest incidence of the Zika virus in the USA. Measurement items were adopted from previous literature (i.e. Zhu, Wei and Zhao 2016; Matthews et al. 2002; Wang, Xiao & Rao 2015; Mackie 2013) and necessary adaptations were made to the items to conform to the context of the Zika virus. In addition, all variables were measured on a 5-point Likert scale. The preliminary data were collected from undergraduate and graduate volunteer students in a large public university in Texas. Professors teaching the courses announced the survey and gave nominal extra credit for voluntary participation of respondents. The number of useable data points was 266, from 296 respondents. The age of the respondents was between 19 and 51, with the mean age of 24. The male: female ratio was 60:40. All of the women were in the reproductive age group, and3.5% were pregnant during 2016 Zika outbreak.

Data analysis and results

To test our research model, we used covariance-based structural equation modeling (CB-SEM) method. Both measurement model and structural model were assessed using Mplus 7.0 software (Muthén & Muthén 1998-2015). This analysis was performed on a sample size of 266 using maximum likelihood with robust standard errors (MLR) estimation. Model fit statistics were calculated, including Chi Square χ2, Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Standardized Root Mean Square Residual (SRMR) and Root Mean Square Error of Approximation (RMSEA) (Hoyle, 1995). MLR estimation technique produced the following model fit statistics for the measurement model: χ^2 (1241) = 2201.083, ρ < .001, CFI = 0.864, TLI = 0.854, RMSEA= 0.054, and SRMR= 0.126. All of these values are within the acceptable range of goodness-of-fit statistics (Byrne 2013). Reliability analysis was carried in SPSS version 23 for all the constructs involved in this study. The Cronbach's alpha analysis revealed that all constructs have alpha above the threshold of 0.8 for basic research (Nunnally 1967). Table 1 shows a summary of AVE along with inter-construct correlations. Construct validity was assessed through convergent and discriminant validity. Convergent validity was supported by large factor loadings for all constructs and statistically significant p-values at the .01 level of significance (Gefen and Straub 2005). And discriminant validity was assessed by the square root of the Average Variance Extracted (AVE) of each latent construct (Gefen and Straub 2005).

	CEX	CS	HC	TP	WF	IS	TFC	EFC	AC
CEX	**0.796**								
CS	0.709	**0.758**							
HC	0.059*	0.063*	**0.808**						
TP	0.082*	0.028**	0.706	**0.803**					
WF	-0.058*	-0.043**	-0.305*	-0.289**	**0.790**				
IS	0.090*	0.036**	0.154	0.147*	-0.073	**0.812**			
TFC	0.127	0.044**	0.190	0.223**	-0.170	0.618**	**0.701**		
EFC	0.135	0.038**	0.392**	0.471**	-0.133	0.430**	0.579**	**0.774**	
AC	-0.075*	-0.038**	-0.023	0.033	0.400**	-0.378**	-0.455**	-0.223	**0.823**

Table 1. Correlation of latent variables and the square root of AVE

Note: Bold numbers are the square root of AVE; CEX: channel expertise, CS: channel strength in message conveyance, HC: hazard characteristics, TP: threat perception, WF: warning fatigue, IS: information search, TFC: task-focused coping, EFC: emotion focused coping, AC: avoidance coping

**ρ<0.05, * ρ<0.1

Structural Model: MLR estimation technique produced the following model fit statistics: χ^2 (1128) = 7492.847, ρ < .001, CFI = 0.872, TLI = 0.864, RMSEA= 0.054, and SRMR= 0.132. At this stage, the structural model results showed that relationship between hazard characteristics and threat perception is significant. However, only the relationship between task-focused coping, emotion-focused coping and threat perception are significant at 0.05 level. Furthermore, the moderator effect of warning fatigue was not statistically significant. Therefore, two hypotheses (H1, and H4) out of four were supported. This means that from the view point of our sample only hazard characteristics have an impact on their threat perception about pandemics. In addition, this threat perception leads to either taking protective actions or emotional reactions. Table 2 provides a summary of hypotheses test results.

Hypotheses	**Path coefficient**	**p-value**	**Hypothes1s test result**
H1	0.039	0.329	Not Supported
H2	0.549	0.000	Supported
H3	0.027	0.687	Not Supported
H4	H4a (TP-> IS): 0.117 H4b (TP-> TFC): 0.159 H4c (TP-> EFC): 0.379 H4d (TP-> AC): 0.139	0.133 0.036 0.000 0.095	Partially Supported

Table 2. Summary of Hypothes1s Test Results

Furthermore, prior literature suggests that individuals respond differently to threats. Results suggest that there is no difference between three different types of behavioral responses such as task-focused coping, emotion-focused coping and avoidance coping across genders. However, male and females in our sample differ with respect to their information search response against their perceived threat.

Conclusion, Limitation and Future Plans

The primary intent of the pilot study was to test the instruments and the research model. The instruments appear to be satisfactory, but the data did not fit model well. We plan to revise the model and re-test. One limitation of the study is that we used college students as respondents. For a pilot to test the scale reliability, this was considered appropriate. Future research will use pregnant women, the population most affected by Zika, as respondents. Further, since our current study is exploratory in nature and all the factors that affect individual and technology cannot be bounded given that the relationships evolve over time and change based on contexts, we will consider the effect of more factors such as pandemic (Zika in our context) awareness stage , efficacy of perceived responsible agency for protection, and information source characteristics. We hope to have a follow-up set of data gathered and analyzed by the time of the conference, based on the lessons learnt in this pilot study.

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