Magnitude Matters: The Impact of Pandemic Threat Perceptions on the Effectiveness of Health Message Framing Across Countries

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Introduction

Minimizing the spread of disease is an important goal of public health organizations, and thus a significant amount of research focuses on motivating consumers to attend to health-related information and to engage in healthier lifestyles. While a great deal of health communications research focuses on lifestyle health issues such as heart problems, smoking related issues and obesity, with the exception of AIDS/HIV communications (e.g. Frankenberger & Sukhdial, 1994; Kennedy et al., 2004), research on infectious/pandemic disease communication is largely absent from inquiry. This is surprising, since pandemic disease communication is a key area in the World Health Organization's sustainable development plan. The World Health Organization's (WHO) investment in expanding health services and containing the human and economic impacts of illness is expected to reach $371 billion in U.S. dollars per year by 2030 (WHO, 2017). Consumers make up one of three important groups (two others being government and business) whose participation and effective response to health communications is vital to reducing the risk of the spread of disease (World Economic Forum, 2016).

The current inquiry begins to fill this gap in the literature by examining how organizations might better motivate consumers to interact with pandemic disease information. "Pandemic" specifically refers to the worldwide spread of a disease (World Health Organization, 2015), where spread can be tracked from place to place, has high attack rates, and is believed to be infectious but may differ in severity (Morens, et al., 2009). Given the vast literature on message framing, we hypothesize that framing can be used effectively to prompt consumers to interact with educational information. Because pandemics refer to worldwide infectious risks of different levels, we also examine the effects across different countries and disease magnitudes. The next section elaborates on the gap, its importance and how we begin to address it.

Research Gap

In the health communications literature, the influence of message framing on consumer response to health content has been examined extensively (e.g., Keller

& Lehmann, 2008).   In addition to examinations of the lifestyle health issues mentioned above, the impact of message framing has also been examined in the context of immunization behavior (e.g. Ferguson & Gallagher, 2007; Haydarov & Gordon, 2015), behaviors related to health screening (Schulz & Meuffels, 2015), and, closer to our area of interest, health information seeking behaviors (Lewi, et al., 2018; Lueck, 2018).   Our focus is different from these past and more recent studies in that we ask: Can message framing be used effectively to motivate consumers to learn about pandemics, and if so, *under what conditions*?   We suggest that the perceived magnitude of a pandemic threat matters and interacts with message framing, in particular valence framing, to influence intentions to seek out health information on such threats.   Magnitude here is defined as the perceived or real level of threat of a pandemic, which we measure either via pretests using scale items or based on reported threat levels.   We posit that emphasizing the positive outcomes related to attending to disease information will better motivate consumers to educate themselves in instances where the pandemic does not trigger panic but is still perceived as a significant threat.

Since our focus is on motivating consumers to interact with health information on potential threats, we test message framing in the context of a digital type call-to-action message that requests individuals to "learn more".   Call-for-action messages are advertisements that ask consumers to perform an act.   In traditional advertising, call-for-action ads use phrases like "call now" (call a phone number) or "act now" (purchase a product).   Digital messages also often use this format because of the interactive nature of the internet and the ability to invoke an immediate response from the consumer via "click-through" banner advertisements or display advertisements (Bellman et al., 2012; Hofacker & Murphy, 1998).   Internet technology has facilitated the delivery of healthcare information and is often used by consumers to learn about healthcare (Loane et al., 2015), so messages must be effective on this channel to attract individuals to health information websites.   In line with this, researchers have investigated the efficacy of health messages in triggering online responses specifically (Lewi et al., 2018).

Given the critical and global nature of pandemics, it is also important to test the feasibility of message strategies in different countries.   We therefore examine the effects across three countries (U.S., Ghana, and China) that differ socioeconomically (cf. Parker, 2012).   Country selection was purposeful, similar to other research where country selection was based on specific parameters that were relevant to the research (e.g. Chance & Deshpande, 2009).   Parker (2012) suggests that structural inequalities across countries affect the impact of disease infection globally.   Ghana continues to struggle with Ebola outbreaks.   Though China until recently had virtually no Ebola risk, the country suffered serious outbreaks of Avian and Swine Flu.   The U.S. was exposed to all of these pandemics in varying degrees.   Thus, these countries allow us to study diseases

where perceived threat varies, which is focal to our research. Further, since structural inequalities affect the impact of disease spread, we believe response to messages for a given disease will differ based on the threat magnitude that is experienced or perceived. Our findings show that first, magnitude matters in message framing, and second, message framing effects hold across three countries for moderately threatening diseases. Theoretically, these findings extend the literature in three ways: (1) we add to the literature where little research to-date addresses how framing effects work across different perceptions of threat magnitude, (2) we examine effects across three countries, where few studies examine effects across country, and (3) we specifically address pandemic type diseases, where virtually no studies address framing in the context of pandemic disease communications. Practically, this research can inform policy makers and health organizations on when and how message framing can be used advantageously in communicating to the public about pandemics.

In the next section, we present relevant background on infectious diseases. Then, we discuss literature and present our hypotheses on message framing in health contexts. We follow this with two studies that test our hypotheses. Note that our literature review is by no means exhaustive, but it does emphasize the most relevant findings that inform our research. Last, we close with a discussion of the findings, how they contribute theoretically and practically, and provide direction for future research.

Background

Health organizations historically and presently grapple with the difficulties measuring the cost, in lives and dollars, and containment of infectious diseases. Pandemics are particularly concerning, because it is difficult to predict how easily these diseases will spread (e.g. in the case of SARS in 2002 and 2003 which affected 29 countries, Butler, 2015). Due to lack of familiarity, pandemics can create significant social instability (World Economic Forum, 2015). For example, early in the 20th century, the flu killed over 50 million people across the globe and whole cities were shut down because of the disease (Walsh, 2015). More recent pandemics include HIV/AIDS, Swine and Bird Flu, Severe Acute Respiratory Syndrome (SARS), Zika virus and Ebola. These outbreaks have also resulted in the loss of millions of lives and billions of dollars in economic activity (Walsh, 2015). More concerning, twenty known infectious diseases have been identified as re-emerging (Coburn et al., 2013) in addition to those diseases currently being addressed that spread quickly.

A "pandemic" refers to the worldwide spread of a disease (World Health Organization, 2015), where spread can be tracked from place to place, has high attack rates, and is believed to be infectious but may differ in severity (Morens et

al., 2009). Pandemic stages, as defined by the World Health Organization (2005) are broken down into *interpandemic*, where there are no human cases of disease detected but a threat exists; *pandemic alert*, where human cases spread but on a localized level; *pandemic*, where there is increased transmission through the general population; and *postpandemic*, where the level of spread tapers off but there is a need for surveillance to detect new disease strains or a re-emergence. Throughout these stages, similar to the World Economic Forum, WHO has identified communication objectives for organizations and the public as a necessary area to address.

Effective communication for this category of disease specifically is a challenge, because of its unique characteristics. When consumers are alerted of a pandemic, heightened levels of fear and lack of knowledge at the onset of an outbreak may lead consumers to rely on inaccurate information and ultimately unsafe health practices (Anonymous, 2014). Yet over time, individuals may "under-respond" to disease communications due to affective habituation, or reduced level of affective reaction that occurs through repeated exposure to a stimulus (Leventhal et al., 2007). Belief that the disease is less threatening can be exacerbated due to lower media coverage of the outbreak as the novelty of the event wears off. Thus, it is important to consider how to motivate consumers to attend to information about pandemics as perceptions about the magnitude of threats change to ensure the spread of cases is minimized and outbreaks do not reoccur. Message framing is one tool that has potential to increase consumer response to call-to-action messages intended to motivate consumers to educate themselves on the potential for harm.

Health Message Framing

Message framing was developed out of prospect theory (Kahneman & Tversky, 1979) and involves presenting objectively equivalent information in different formats to influence judgement. When messages are framed, the factual content does not change, but the way the message is presented varies. For example, a given health message might emphasize an 80% survival rate (positive frame), or it might emphasize a 20% fatality rate (negative frame).

Findings related to framing effects for health messages vary based on numerous factors (Keller & Lehmann 2008; Levin et al. 1998). Though research shows that framing effects materialize when perceived risk is high (Keller, 2014), other research suggests that messages generally are more persuasive when fear is moderate (Keller & Lehmann, 2008). Other studies demonstrate loss frames are more effective when response efficacy is low or the outcome of an action is uncertain (e.g., Block & Keller, 1995; Meyerowitz & Chaiken, 1987; Rothman et al., 1993). However, gain framed messages are shown to be more persuasive

when involvement with the health issue is low (e.g., Maheswaran & Meyers-Levy, 1990). Gain framed messages also outperform loss framed messages in the context of prevention behaviors (Gallagher & Updegraff, 2012). Though negatively framed messages are suggested to be more effective when attempting to influence detection behaviors (Rothman & Salovey, 1997), little support to-date exists for this assertion, which could be related to how risk is construed (Gallagher & Updegraff, 2012). Additionally, research shows that positively framed health communications are more effective than negatively framed ones when attribute framing is used (Krishnamurthy et al., 2001), unless dealing with extremes (Levin et al., 1998), though limited evidence exists.

Pandemics at different levels of perceived magnitude might be akin to differing levels of extremes in outcomes as noted by Levin et al. (1998). We therefore propose that a positively framed message will be more effective in generating intention to click for information than a negatively framed message when the perceived magnitude of a threat is moderate, but not when it is perceived to be high or low. Though research shows negative frames to be more effective when response efficacy is low or outcomes are uncertain (e.g. Block & Keller, 1995; Meyerowitz & Chaiken, 1987), these characteristics are more inherent in preventive or detection behaviors, not in responding to communication requests to learn more, which is the context of interest in the current study. Therefore,

H1: Intention to click through an informational message about a pandemic disease will be significantly higher for positively framed messages as compared to negatively framed messages when the disease is perceived as moderately threatening (but not when the disease is perceived as highly or minimally threatening).

Rothman & Salovey (1997) suggest that risk perceptions can mediate the relationship between message frame and behavior and Keller & Lehmann (2008) suggest messages are more effective when fear is moderate. Combining these, we propose:

H2: Perceived risk mediates the relationship between message frame and intention to click when the disease is perceived as moderately threatening (but not when the disease is perceived as highly or minimally threatening).

We test our hypotheses in two studies. Study 1 examines the effectiveness of message framing and the mediating role of perceived risk using Ebola as the focal disease. Ebola at the time of the study was a pandemic that varied in magnitude of threat in different countries. Study 2 adds support to the findings of Study 1 by examining three different diseases that vary in magnitude of threat within country.

Study 1 - Framing effects and disease magnitude across countries

Testing stimuli

Before running the actual study, a pretest was conducted for the valence manipulation of the advertisements. We utilize attribute framing in constructing our messages (see figure 1), in line with the objectives of our study and previous research findings. Attribute framing focuses on the attribute(s) of an object and how framed attributes affect evaluation (Levin et al., 1998). Thus, the valence of the outcome is not manipulated, just the valence of a characteristic or characteristics. For example, call-to-action messages can highlight either a positive message element ("encouraging news") or a negative message element ("discouraging news") and then asking respondents to perform an action that is not framed ("click here to learn more").

Through an online panel, 55 participants across age groups (between 18-65 years) and from various parts of the world (Canada, Germany, India, Italy, U.K., U.S.; 62% female) were assigned to either a positively or negatively framed message similar to what would be found in an internet banner or panel ad. They were asked to respond to a measure of importance of the ad (1=Important to 7=Unimportant) and whether the ad contained positive or negative statistics. Message frame was manipulated in the ad by either stating early detection and cure rate (positive frame) or late detection and mortality rate (negative frame), as reflected in Figure 1.

Figure 1: Framing Stimuli

[Positive]

Ebola is a deadly disease and a large number of people who have it do not detect the disease early. Early detection of the disease can improve your ability to be cured of Ebola. Of those who are infected by the disease, about 30% are cured of the disease.

Click here to learn more about Ebola.

[Negative]

Ebola is a deadly disease and a large number of people who have it do not detect the disease early. Late detection of the disease can hurt your ability to be cured of Ebola. Of

> those who are infected by the disease, about <u>70% do not survive the disease</u>.
>
> <u>Click here</u> to learn more about Ebola.

In response to the importance question, participants thought both ads were equally important irrespective of the valence framing of the ad, 5.27 vs. 4.90, t (df=53) < 1, p >.5.[1] With regard to the manipulation, the majority of the participants correctly remembered that the ad contained positive (85% of participants) or negative (90% of participants) statistics about the disease condition they saw. Thus, the manipulation was successful; therefore, these ads were used in the studies.

Method

The objective of Study 1 was to test H1 and H2. That is, we expect framing effects on intention to click to materialize and to be mediated by risk when the disease is perceived to be moderately severe. We test this across three countries where the threat of the disease, Ebola, would be perceived differently: Studies 1A (Ghana-high magnitude), 1B (U.S.-moderate magnitude), and 1C (China-low magnitude). We chose Ebola as our relevant disease because at the time of data collection, it became widespread in western Africa, there were several cases of Ebola in the U.S. and it was getting more attention, and Ebola was not present in China. These countries also represent different levels of development, where pandemics and the risk of mortality can differ based on socioeconomic conditions (Parker, 2012).

Design and Procedure

A between-subjects experimental design was used to test the framing effects on intention to click for more information about the disease in each country. Subjects were drawn from universities in each of the three countries, and participants were sent an emailed link to the experiment. The universities in Ghana and China were English-speaking, and a faculty member at each university reviewed the content of the messages for comprehension. When participants clicked through the link, they were informed that they would be viewing and responding to an internet-based ad that recently appeared. When they clicked next, they were exposed to either the positively or the negatively framed advertisement about Ebola that was pretested. After viewing the ad, participants were asked their intention to click on the ad and perceived risk. Age, gender, ethnic background, and education level were collected as covariates, along with

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[1] Because the importance scale was reverse coded with 1=important and 7=unimportant, we recoded the scale as 1=unimportant and 7=important during analysis for easier interpretation.

importance, relevance, concern and interest in the message as measures of involvement.

Mediator

Perceived risk was measured by a 3-item Likert scale (1=Strongly disagree to 7=Strongly agree). The three items were: *I worry about getting infected by the Ebola virus*, *I feel it is likely that I will be infected with the Ebola virus*, and *Getting Ebola is something I think about*. Though the Cronbach alpha for China (α=.58) was relatively low, it approaches .60, which is reasonable for exploratory work (Nunally, 1978). The alphas for Ghana and the U.S. were acceptable (Ghana=.70, US=.78).

Dependent variable

Intention to click was measured using 3-items: *How probable is it that you would consider clicking on this ad?* (1=Very probably to 7=Not very probable); *Would you be more likely or less likely to click on this ad, given the information shown?* (1=Very likely to 7=Not at all likely); and *How likely would you be to click on this ad, given the information shown?* (1=Very likely to 7=Not at all likely). All items were recoded prior to analysis, so 7 corresponded with "very" and 1 corresponded to "not" For ease of interpretation. Cronbach alphas were all in the acceptable range (Ghana=.88, U.S.=.95, China=.88).

Study 1A: Ghana, high magnitude of threat

Sample

Two-hundred twenty-three undergraduate students from a Ghanaian university participated in the online study. Students were randomly assigned to the positive and negative framing conditions. Thirty-nine percent of participants were female and 92% belonged to the 18-24 age bracket.

Results

Covariates were not significant (all ps>.10), so they were dropped from the analysis. An independent sample t-test resulted in a non-significant framing effect for Ghana. As expected, there were no significant differences in framing effects on intention to click for messages in the case of Ghana, t (221) <1, p >.4 (See Table 1). In examining differences in perceived risk by frame, no significant

differences were found, p >.4, also as expected. Thus, given no significant effects, the test for perceived risk mediation was not run.

Table 1

Study 1A-C: Mean intention to click* by frame by country (magnitude)

	Positive	Negative	P Value
Ghana	5.58	5.46	.47
US	4.61	3.84	.02
China	5.11	5.41	.23

*Higher mean equates to higher intention to click.

Study 1B: U.S., moderate magnitude of threat

Sample

Ninety-three undergraduate students from a U.S. university participated in the online study. Once again, students were randomly assigned to the positive and negative framing conditions. Forty-nine percent of participants were female, and all belonged to the 18-24 age bracket.

Results

Covariates were not significant (all ps>.10), so they were dropped from the analysis. An independent sample t-test resulted in a significant framing effect on intention to click, t (91) = 2.31, p <.05, in support of H1. Also as expected, the framing effect on perceived risk was significant, t (89) = -2.06, p <.05. Therefore, Hayes' (2013) PROCESS Model 4 was used to test for mediation. We included message frame (positive vs. negative) as the independent variable, perceived risk as the mediator, and intention to click as the dependent variable. Consistent with Hypothesis 2, there was a significant indirect effect for message frame on intention to click through perceived risk, indirect effect = -.17; 95% CI: -.0007 to -.4114. This provides support for the mediating role of perceived risk for the U.S. test.

Study 1C: China, low magnitude of threat

Sample

One-hundred five undergraduate students from a Chinese university participated in the online study and were randomly assigned to one of the two framing conditions. Seventy-one percent of participants were female. Seventy-five percent were ages 18-24 and 25% were ages 25-34.

Results

Covariates were not significant (all ps>.10), so they were dropped from the analysis. An independent sample t-test once again resulted in a non-significant framing effect on intention to click, $t(103) = -1.22$, $p > .2$. Further, in examining differences in perceived risk by frame, as expected no significant differences were found, $p > .4$. Since no framing effect materialized, the test for perceived risk mediation was not run.

Discussion

The findings from Study 1 support the notion that positively framed messages are more effective than negatively framed ones in cases where pandemics are moderately severe (H1). Further, the effect was found to be mediated by perceived risk associated with the disease (H2). Thus, our initial evidence demonstrates that message framing can be an effective tool to elevate click through intentions.

Note that intention to click overall (collapsing across frame) is significantly lower in the U.S., where Ebola is perceived as being moderately severe, compared to Ghana and China, $M_{US} = 4.2$ vs. $M_{Ghana} = 5.53$, $t(314) = 7.87$, $p < .001$; $M_{US} = 4.2$ vs. $M_{China} = 5.27$, $t(196) = 5.22$, $p < .001$. China and Ghana differ marginally, $t(326) = 1.77$; $p < .1$. Though we did not intuitively expect the low threat condition to prompt higher levels of intention to click compared to the moderate condition, the evidence from Study 1 shows this to be the case. However, the differences in click-through by country could be a function of measurement between country, rather than it being the case that individuals are less likely to respond to information messages when perceived magnitude is moderate. The design of Study 2 allows us to explore this more.

In Study 2 we examine magnitude levels within country to support Study 1 results; thus, Study 2 serves as a replication of Study 1. This study also allows us to ensure that country effects were not responsible for the results. Further, using a within country design allows us to better examine the relative impact of the message framing influence on behavioral intention not only for the moderate condition but in comparison to response in the extreme conditions.

Study 2 - Framing effects and disease magnitude within country

Method

Study 2 was executed in two parts. First, Study 2A took place in China, and then Study 2B took place in the US. The core objective was to retest H1, this time empirically testing the framing effects of moderate- (vs. low and high) magnitude diseases within country. The experiments were similar to those in Study 1, but this time disease was manipulated along with frame.

Design and procedure

For each country, a 2 message frame (positive, negative) x 3 threat magnitude (high, medium, low) between-subjects experiment was used. The experiment was delivered to participants via an emailed link. The ad was the same as in Study 1, but the disease was also manipulated as just mentioned. Participants were first told that they would be viewing an ad that was recently posted. They then viewed one of the randomly assigned message frames and diseases. Finally, they were asked to indicate their intention to click and relevant covariates as in Study 1.

Study 2A: China

Pretest

In order to capture different levels of perceived magnitude of threat, 39 pretest respondents who were similar to those that participated in the experiment rated 10 diseases on perceived magnitude of threat. Note that perceived threat is defined as the thoughts about danger or harm in the environment (Witte 1994). It is operationalized in the Extended Parallel Process Model (EPPM) that explains how individuals respond to fear (Witte, 1994), the fear/control framework developed by Leventhal (1970) and in Protection Motivation Theory (Rogers 1975) to explain how individuals respond to fear and danger. Thus, for pretest purposes, respondents were asked to rate their level of agreement with the following for the ten diseases: "*If I were to get [disease], the consequences for me would be severe*" (1=Strongly disagree to 5=Strongly agree). We used pretest results for the moderate and low magnitude conditions, being Tuberculosis and Ebola respectively, M_{TB}=3.82 vs. M_{Ebola}=3.38, t (38) = -2.041, p<.05. However, for the high magnitude condition, MERS was selected because news broke at the time of our study that China was put on high alert for MERS

(http://www.bbc.com/news/world-asia-china-32926170). Thus, we chose to take advantage of the timing of the news and the running of our study.

Findings

Seventy-four undergraduate students from a Chinese university participated in the study and were randomly assigned to the positive or negative framing conditions for one of the three disease types (Ebola – low magnitude, Tuberculosis – moderate magnitude, MERS - high magnitude). Eighty-one percent of participants were female. Eighty-six percent were ages 18-24 and 13% were ages 25-34.

Independent sample t-tests for each type of disease were run and yielded the expected pattern of results. Specifically, positive (vs. negative) framing led to significantly greater intention to click, 5.36 vs. 4.04, t (18) =2.13, p <.05, in case of TB (the moderately severe disease). Framing effects were not significant for Ebola - low magnitude, t (23) < 1, p >.5; or MERS - high magnitude, t (27) < 1, p >.7 (Table 3). This reconfirms H1. Do note, covariates were not significant so were dropped from the analysis.

Table 2
Study 2A: China mean intention to click* by frame by magnitude

	Positive	Negative	P Value
MERS (high)	4.91	5.13	.68
TB (Moderate)	5.36	4.04	.05*
Ebola (Low)	4.98	4.63	.45

*Higher mean equates to higher intention to click

Study 2B: U.S.

Pretest

Like Study 2A, pretest participants in the U.S. indicated their perceptions of magnitude for ten diseases ("*If I were to get [disease], the consequences for me would be serious.*" (1=Strongly disagree to 5=Strongly agree). Based on the ratings, HIV/AIDS (high, *M*=4.54), Ebola (Moderate, *M*=4.49) and Tuberculosis

(Low, *M*=3.89), F (2, 33) = 6.44, p=.004, were selected. Even though the means for HIV and Ebola were not statistically different, the CDC (cdc.gov) indicates greater incidence for HIV in the U.S. compared to Ebola. Thus, it was kept for the high magnitude condition.

Results

One-hundred thirteen undergraduate students from a northeastern university participated in the actual study. In order to check whether the valence framing was effective, in this study participants were asked what kind of information they saw in the ads: positive/negative statistics about the disease. The majority of the participants correctly identified that the message content was positive (75% of participants) or negative (81% of participants) for the condition they were given. Thus, the manipulation of valence framing in the messages was deemed to be successful.

Once again, independent sample t-tests for each type of disease yielded the expected pattern of results. As expected, positive (vs. negative) framing led to significantly greater intention to click, 4.30 vs. 3.47, t (38) = 2.21, p <.05, in case of Ebola (the moderate magnitude disease) (Table 2). Framing effects were not significant for Tuberculosis-low magnitude; t (34) <1, p >.6, or HIV-high magnitude; t (35) < 1, p >.5. These findings add support for H1. Note, covariates were not significant so were dropped from the analysis.

Table 3
Study 2B: U.S. – Mean intention to click* by frame by magnitude

	Positive	Negative	P Value
HIV (High)	4.37	3.92	.47
Ebola (Moderate)	4.30	3.47	.05
TB (Low)	5.10	5.38	.62

*Higher mean equates to higher intention to click

Discussion

Study 2 findings add support for framing effects materializing when the magnitude of disease is perceived as moderate, reconfirming H1.   Using within

country designs, Studies 2A and 2B demonstrate that using positively framed messages is effective in raising click intentions when diseases are considered moderately severe only, but not when magnitude is considered low or high.

In Study 2, we were able to directly compare the impact of frame in motivating response in the moderate condition to the levels in the high and low threat conditions. In the U.S., for moderate threat magnitude, the intention to click in the positive condition (M=4.30) is aligned with intention to click for high magnitude, though it does not reach the level of intention for the low magnitude condition. The gains in intention however are still notable, as positive frames are significantly influential when threat is moderate. In China, the positive frame is even more impactful, bringing the level of response (intention to click) in line with both extreme conditions. There are no significant differences between the positively framed message response in the moderate condition and any of the means in the high or low threat conditions for this country.

Recall that Study 1 results suggested that intention to click might be generally lower (collapsing over frame) when threat is moderate. Study 2 results do not fully support this possibility, as the overall mean intention to click for the moderately threatening disease in the U.S. is not significantly different from the high magnitude condition (t (75) <1, p >.5), though it is significantly different from the low magnitude condition (t (74) = 4.03, p < .001). Also note for the U.S. that the mean difference in intention to click between the high magnitude condition is significantly different from the low magnitude condition (t (71) = 2.66, p < .01). This finding deserves more attention, as it is concerning that intentions to respond to educational message prompts could be less effective in the more important instances of threat in the U.S. It is possible that the low magnitude condition prompts curiosity without cost (no perceived risk of getting a disease), which may motivate consumers to respond more strongly with regard to learning about disease. Alternatively, it could be that diseases perceived as less threatening are also less familiar, and that is influencing intention to click. In China, the overall mean intention to click in the moderately threatening condition is not significantly different from either the high threat condition (t (47) <1, p>.5) or the low threat condition (t (43) <1, p>.8).

General Discussion, Limitations and Future Research

One of the difficulties policy makers face during a pandemic emergence is competing with the myriad of information sources (many of which provide false solutions) about the disease. For example, the 2014 Ebola epidemic was the largest in history and spread across multiple continents. Thousands of individuals lost their lives and many families and communities were severely affected (Coltart et al., 2017). Misinformation was common in the communities hard hit

by the disease, and some of this misinformation led to unsafe practices that led to the further spread of the disease (Anonymous, 2014). Likewise, SARS froze travel to multiple areas in the world and caused the loss of over $54 billion in business worldwide (Walsh, 2015). Influenza continues to be problematic, even in developed countries where individuals lack knowledge about the consequences of influenza and rely on mass media for information, rather than health authority information (Kristiansen et al., 2007). Thus, being able to cut through the clutter to get the attention of the general public is extremely important.

This research contributes to the international health communications and public policy areas by testing the effectiveness of message framing that may be useful to governments and medical/health organizations as they try to grapple with ways to reach regions at risk of pandemics. Across two sets of studies executed in three countries, we demonstrate that positively framed messages can be more effective than negatively framed messages in prompting consumers to find out more about pandemic type diseases. However, this framing advantage only ensues when pandemics are considered moderately severe, such as what may be the case in the secondary stage of a disease's life cycle when there is less media attention. This is important, as it is in such a stage that consumers are less likely to respond to calls for education, which could ultimately make more individuals vulnerable to infection or increase risk as pandemics re-emerge (e.g. Coburn et al., 2013). Our findings also do show some evidence that when framing effects materialize (when diseases are moderately severe), the effects on intention are mediated by risk perception. Notably, we demonstrate why magnitude is important to consider when choosing how to frame communications about disease and provide evidence that the effects found are consistent across three very different countries.

An especially relevant example where consumer prevention measures are important worldwide is pandemic influenza. Pandemic influenza outbreaks are difficult to predict, but historically and into present day continue to have significant impact (see Morens & Taubenberger, 2011, and Zheng et al., 2015). Research shows this disease to be perceived as a moderate threat, and individuals exhibit an optimism bias towards it, believing they won't contract it but others will (Xu & Peng, 2015). Because individuals attend less to protective actions, such as staying out of work when infected (Kristiansen et al., 2007), the virus spreads more than it would otherwise. For this moderate threat example, if positive message frames are used to prompt consumers to attend more to information on the disease, the spread and associated productivity and healthcare costs of the pandemic might be reduced.

Though our research demonstrates that intentions to click on information about pandemics can be increased by using positive message frames when a disease is perceived as moderately threatening, it is also important to find ways to further

elevate click-through rates during initial outbreaks and when the pandemic spread is increasing. Thus, different message formats might be useful in heightening information search in high threat conditions. Future research could explore these other means. For example, imagery may be an effective way to elevate click-through when disease magnitude is high. With regard to the generally high intention to click found in the studies reported here when perceive magnitude of a threat is low, research into why individuals are more likely to respond in such conditions could prove fruitful.

While we find message framing to be an effective tool for motivating consumers to learn more about pandemic threats when threats are perceived as moderate, it cannot be left unsaid that communicators need to act responsibly in using communication tools to nudge consumers to act in ways to best protect themselves and others from disease spread. We believe framing of accurate disease information does not exaggerate claims, but it is possible to also use framing to make exaggerated claims even more effective. Inquiries into effective ways of policing unethical or inaccurate communications is a public policy issue outside of the purview of this particular research but none-the-less important.

Although our studies extend research on message framing in health communications, further research needs to be conducted on the role of risk and to examine additional mediators that could impact the effectiveness of message framing. Though we found some support for risk mediating the framing effect for moderately severe threats, we cannot say the process explains the framing effect with much confidence with the limited study of it here. Additionally, though we had hoped to access participants from all three countries for both studies reported herein, at the time of study execution it was not possible. In Ghana, it is very difficult to collect data due to lack of connectivity, dropped connections and a need for a contact in that region to facilitate the study by providing connection access to participants. Future research can seek to further test message strategy effectiveness in countries where the public may have less access to healthcare providers and information access more generally.

Lastly, though we focus on message framing as a communication tool that is useful to motivate consumers to act, other communication tools might also be effectively used in call-to-action messages related to disease communications. One such tool is the use of an incentive that could be offered to consumers if they click through educational messages. Providing something for "free" has been found to motivate consumers in other context (Ariely, 2009) and might also be useful in disease communications. For example, testing the effectiveness of offering consumers free information guides or clinic visits if they click on a promotional message and read health organization recommendations / register on the health organization website might prove fruitful. While free clinic visits would bear a cost to both the communicator in terms of providing care and the

consumer in terms of time, the incremental cost of providing information guides is zero if that information is already provided by health organizations via the internet. Though incentives may also be a useful tool, the complexity of building and monitoring incentive programs can make them less attractive compared to equally effective but simpler strategies, such as message framing.

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