Brief Original Report

Knowledge and risk perceptions of the Ebola virus in the United States

Jonathan J. Rolison [a,*], Yaniv Hanoch [b]

[a] Queen's University Belfast, Belfast, UK
[b] University of Plymouth, Plymouth, UK

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ABSTRACT

Objectives. The Ebola epidemic has received extensive media coverage since the first diagnosed cases of the virus in the US. We investigated risk perceptions of Ebola among individuals living in the US and measured their knowledge of the virus.

Method. US residents completed an online survey (conducted 14–18 November 2014) that assessed their Ebola knowledge and risk perceptions.

Results. Respondents who were more knowledgeable of Ebola perceived less risk of contracting the virus and were less worried about the virus, but also regarded Ebola as more serious than less knowledgeable respondents. The internet served as a major source of additional information among knowledgeable respondents.

Conclusion. The findings suggest that the provision of health information about Ebola may be effective in informing the public about Ebola risks and of preventive measures without curtailing the seriousness of the virus. Policymakers may seek to further exploit the internet as a means of delivering information about Ebola in the US and worldwide.

Introduction

On September 30, 2014, the Center for Disease Control and Prevention (CDC) confirmed the first Ebola case in the United States (US), with three further cases being widely reported thereafter (Centers for Disease Control and prevention (CDC), n.d.a). The diagnosis of the Ebola virus in the US followed shortly after the World Health Organization (WHO) declared the Ebola outbreak "a public health emergency of international concern" (World Health Organization, n.d.). As part of its precautionary steps, the CDC devoted an entire website to the Ebola outbreak providing information about the disease signs and symptoms, transmission, prevention, diagnosis, and treatment (Centers for Disease Control and prevention (CDC), n.d.b).

While the risk of contracting the virus in the US is small, the Ebola epidemic has received extensive and continuous coverage in the US media, with close to 1000 segments about the virus aired between October 7 and November 3, 2014 (Gertz and Savillo, 2014). On the one hand, media focus on emotive topics can give rise to biased public perceptions that exaggerate the risk of rare events (Combs and Slovic, 1979; Frost et al., 1997). On the other hand, availability of the internet and the freedom to search among web-based sources affords easy access to health information (Berland et al., 2001; Rolison et al., 2012). News websites are a particularly popular source of new information during outbreaks of infectious diseases (Van Velsen et al., 2012).

Relevant disease knowledge, such as of SARS, has been linked to less worry about personal risk (Brug et al., 2004; Voeten et al., 2009). For example, knowledge that a SARS outbreak has not affected one's geographical region is linked to lower perceived personal risk of contracting the disease (Jiang et al., 2009).

In the current study, we assessed risk perceptions of Ebola among individuals living in the US and measured their knowledge of the virus. We hypothesized that (a) better knowledge of Ebola would be linked to lower perceived risk of contracting the virus and that (b) the internet would be one of the major sources of information about Ebola among knowledgeable individuals.

Methods

Two hundred twelve respondents were recruited via Amazon's Mechanical Turk (AMT) to complete an online survey (conducted 14–18 November 2014) of their knowledge and perceptions of the Ebola virus. AMT is an online recruitment service on which research surveys can be advertised to more than 100,000 individuals. The reliability of the AMT participant sample has been validated elsewhere by comparisons with national samples and other recruitment methods (Paolacci et al., 2010; Berinsky et al., 2012). In line with US census norms (Ewert and Kominski, 2012), almost all respondents (95%) had completed at least lower secondary or vocational education and a majority (64%) had completed higher vocational or university education. All were US residents and all except one respondent was born in the US. Respondents' internet protocol (IP) address was used to identify

* Corresponding author at: Department of Psychology, Queen's University, David Keir Building, Belfast BT7 1NN, UK.

Table 1
Sample characteristics (n = 212).

	$\bar{x}$ (s) or percentage
Age	33.20 (10.90)
Male gender	57%
Education	
Primary school of no education	5%
Lower general secondary or lower vocational education	8%
Intermediate/higher general secondary or intermediate vocational education	23%
Higher vocational education or university education	64%
Ethnic group	
White	50%
Caucasian	30%
Hispanic	5%
Black	4%
African American	4%
Asian	5%
Other	2%
Area of residence	
City	50%
Town	37%
Village	3%
Countryside	10%

Note. Ethnic group was an open question.

their geolocation to confirm their presence in the US. Most identified they were living either in a city (51%) or a town (37%). Table 1 provides the sample demographics.

Total Ebola knowledge scores (Table 2; Section A) were calculated by summing correct responses across item 1 (correct = [a]), item 2 (correct = [d]), item 3 (correct = [b] and not [a]), item 4 (correct = [c] and [d]), and item 5 (correct = [a]), generating a maximum possible score of five. Seven items (Table 2; Section B) measured sources of new information about Ebola in the past year, trust in information sources, perceptions of preventive measures, and willingness to pay for an Ebola vaccine. Six items (Table 2; Section C) assessed perceived risk, seriousness, and worry about Ebola, and fourteen items (Table 2; Section D) measured perceptions of risk and seriousness for other medical conditions (Brug et al., 2004).

Results

Most respondents (90%) were familiar with the Ebola concept. A remaining 9% had heard of it, and only three had not heard of it. More than half (67%) correctly identified Ebola as a fatal illness transmitted to people from wild animals and many (65%) were aware that the virus is contracted via direct contact with bodily fluids and not via contact with airborne droplets. Most respondents associated Ebola with fever (83%) and flu-like symptoms (82%), and some identified muscle pain (47%), coughing (37%), and pneumonia (13%). All but one of the respondents believed it is possible to die from Ebola. A mean of 53 people (standard deviation [SD] = 27.8) were estimated by respondents to die among 100 infected with Ebola. The mean total knowledge score was 3.9 (SD = 1.0; 1 correct = 1%, 2 correct = 9%, 3 correct = 21%, 4 correct = 36%, 5 correct = 32%).

The internet (92%) and media (86%) were identified as among the major sources of new information about Ebola in the past year. The internet was rated as the most trustworthy source (mean [M] = 6.2, SD = 1.9), followed by the government (M = 5.9, SD = 2.34), and the media (M = 5.4, SD = 2.2). Respondents believed they were moderately informed about protective measures against contracting Ebola (M = 6.3, SD = 2.2) and the majority believed that it was either quite possible (37%) or definitely possible (39%) to take preventive actions in the event on an outbreak in the US. If a vaccine against contracting Ebola were to be made available, respondents were willing to pay a

Table 2
Survey items regarding knowledge, information sources, and perceived risk of Ebola and other medical conditions.

Section A: Knowledge of Ebola

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1. Are you familiar with the concept "Ebola virus"?
   (a) yes, I know what it is, (b) I have heard of it but I am not sure what it is, and (c) no, I have never heard of it
2. To the best of your knowledge, the Ebola virus is:
   (a) an infectious disease of the upper respiratory tract normally lasting 7 to 10 days, (b) an infection caused by several types of swine influenza viruses, (c) a virus that is transmitted by whiteflies that feed on plant leaves, and (d) a severe and often fatal illness transmitted to people from wild animals
3. To the best of your knowledge, the Ebola virus is typically spread (i.e., passed from person-to-person) by which means? You may choose more than one.
   (a) contact with airborne droplets via breathing, sneezing, or coughing, (b) direct contact with bodily fluids in sweat, mucus, blood, or vomit, (c) unpredicted sex or other sexual contact, and (d) ingestion of contaminated water or food
4. Can you name the most important symptoms of Ebola? You may choose more than one.
   (a) cough, (b) pneumonia, (c) fever, (d) flu-like symptoms, (e) muscle pain, (f) other; namely: ..., and (g) I do not know any symptoms of Ebola
5. Do you think it is possible to die from the Ebola virus?
   (a) yes, (b) no, and (c) I do not know

Section B: Sources of information and preventive measures

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5. From what sources below have you received new information about the Ebola virus in the past year? You may choose more than one.
   (a) the media (television, newspapers, radio etc.), (b) the internet, (c) general practitioners (doctors), (d) friends and family members, (e) I have never heard of the Ebola virus, and (f) other: ...
6–8. In general, how trustworthy do you think the [media, internet, government] is as a source of information? (1 = not at all trustworthy, 10 = extremely trustworthy)
9. In general, do you think that people can take actions to prevent contracting the Ebola virus in case of an outbreak in the country you live?
   (a) not at all, (b) a little bit, (c) quite a bit, and (d) definitely
10. To what extent do you feel you are informed about the protective measures that could be taken to avoid contracting the Ebola virus? (1 = not at all informed, 10 = extremely informed)
11. How much would you be willing to pay for a vaccine that would protect you against contracting the Ebola virus? US dollars ...

Section C: Perceived risk of Ebola

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12. How likely do you think you are to contract the Ebola virus within the next year? (1 = not at all likely, 10 = extremely likely)
13. How serious would it be for you to contract the Ebola virus in the next year? (1 = not at all serious, 10 = extremely serious)
14–16. How likely do you think people in [Africa, Europe, US] are to contract the Ebola virus in the next year? (1 = not at all likely, 10 = extremely likely)
17. How worried are you about contracting the Ebola virus in next year? (1 = not at all worried, 10 = extremely worried)

Section D: Risk and seriousness of other medical conditions

18–24. How likely do you think you are to get [diabetes, common cold, HIV, heart attack, malaria, food poisoning, high blood pressure] in the next year? (1 = not at all likely, 10 = extremely likely)
25–31. How serious would it be for you to get [diabetes, common cold, HIV, heart attack, malaria, food poisoning, high blood pressure] in the next year? (1 = not at all serious, 10 = extremely serious)

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median of $25 (modal amount = $100; 16%). A minority (14%) were not willing to pay for a vaccine.

The respondents provided low ratings of worry (M = 2.3, SD = 1.9) and personal risk (M = 1.7, SD = 1.4) with regard to contracting Ebola. Their personal risk was perceived as lower than that of others in the US (M = 2.6, SD = 1.9; $t(212) = 8.46$, $p < .001$; Fig. 1). Europe was perceived as more at risk (M = 3.0, SD = 2.0) than the US ($t(212) = 4.33$, $p < .001$), with Africa most at risk (M = 6.5; SD = 1.9). Perceived personal risk of contracting Ebola was lower than for all other medical conditions (Fig. 1), except for HIV (M = 1.4, SD = 1.0; $t(212) = 3.90$, $p < .001$) and malaria (M = 1.5, SD = 1.1; $t(212) = 3.55$, $p < .001$). Conversely, Ebola was perceived as more serious (M = 8.5; SD = 2.2)
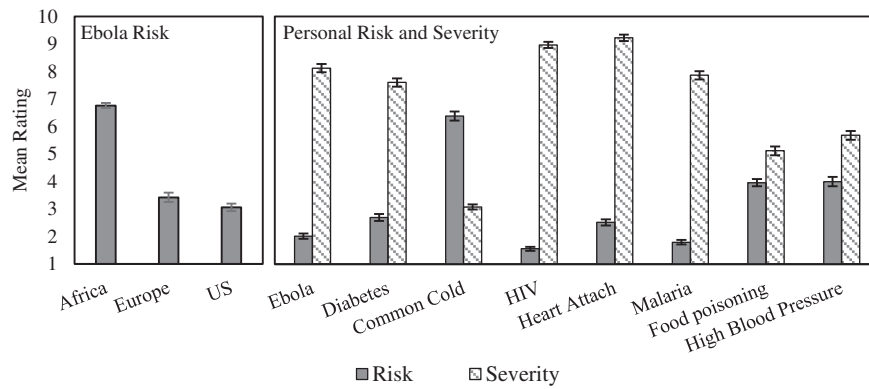
Fig. 1. Perceived risk of people living in Africa, Europe, and the US contracting Ebola, and perceived personal risk and seriousness of contracting Ebola and other medical conditions. Error bars represent 1 SE either side the mean. Survey completed online (conducted 14–18 November 2014) by US residents.

than all other medical conditions, except for HIV (M = 9.2, SD = 1.6; $t(212) = 5.39$, $p < .001$) and heart attack (M = 9.3, SD = 1.7; $t(212) = 5.56$, $p < .001$).

Total Ebola knowledge scores predicted less worry about contracting the virus ($r = -.22$, $p = .001$), lower perceived personal risk ($r = -.26$, $p < .001$), and lower risk faced by others in the US ($r = -.15$, $p = .026$) and in Europe ($r = -.16$, $p = .021$), but higher ratings for the seriousness of contracting the virus ($r = .32$, $p < .001$). More knowledgeable respondents were more likely to believe that preventive actions could be taken against contracting Ebola in the case of an outbreak ($r = .17$, $p = .016$) and felt more informed about protective measures ($r = .21$, $p = .002$). The internet ($M_{NO} = 3.2$, $M_{YES} = 4.0$; $t(210) = 3.25$, $p = .001$), and no other sources of information, were associated with better knowledge of Ebola.

Discussion

In light of international concern and the mass media focus on the Ebola virus, the present study assessed knowledge and risk perceptions of the virus among people living in the US. In possibly the first study of its kind, it was revealed that knowledge of Ebola was strongly implemented in people's risk perceptions of the virus. Here, it was found that more knowledgeable individuals perceived less risk of contracting Ebola for themselves and for others. Further, they were less worried about contracting the virus, and perceived greater control over preventive actions against contracting Ebola in the event of an outbreak in the US. Yet, they also regarded contracting Ebola as more serious compared to their less knowledgeable counterparts. These findings provide a tentative suggestion that the provision of accurate health information about Ebola could be effective in informing the general public about the risks of Ebola and of preventive measures without curtailing the seriousness of the virus.

The current study has a number of limitations. Our sample size may not necessarily reflect characteristics of the general population. The sampling method may also have biased our sample characteristics. A key finding of the current research is the relationship between Ebola knowledge and worry, awareness of preventive measures, and perceptions of perceived personal risk, which should apply to other samples.

Individuals who were knowledgeable of Ebola identified the internet as one of the major sources of new information about the virus in the past year. Moreover, respondents rated the internet as the most trustworthy source of Ebola information. The internet provides on-demand access to health information (Berland et al., 2001; Rolison et al., 2012). With the internet playing such an important role in providing information about Ebola, it is crucial that accurate and reliable information is made available online. Our current findings, in support of other studies

(Berland et al., 2001; Rolison et al., 2012; Van Velsen et al., 2012), suggest that policymakers may seek to further exploit the internet as a means of delivering information about the Ebola virus in the US and worldwide.

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Conflicts of interest

The authors declare that there are no conflicts of interest.

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