

Media Messages and Perception of Risk for Ebola Virus Infection, United States

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News media have been blamed for sensationalizing Ebola in the United States, causing unnecessary alarm. To investigate this issue, we analyzed US-focused news stories about Ebola virus disease during July 1–November 30, 2014. We found frequent use of risk-elevating messages, which may have contributed to increased public concern.

The 2014–15 outbreak of Ebola virus disease (EVD) generated much news media coverage and highlighted the role of news media with regard to providing information about risks to the public (1–3). Research shows that the news media can influence knowledge and perceptions about a topic (4–6). The way risks are discussed and communicated (often through news coverage) can also affect how risk is perceived (7–9). Our objective was to analyze the volume and content of messages promoted in US news media with regard to risk for EVD and to examine how these messages relate to risk-perception theory.

The Study

Using established methods, we analyzed EVD coverage from 12 news sources (9 print, 3 television) published July 1–November 30, 2014 (online Technical Appendix Table 1, <http://wwwnc.cdc.gov/EID/article/23/1/16-0589-Techapp1.pdf>). News media stories were collected through searches of LexisNexis, ProQuest, and NewsBank online archives by using the term “Ebola.” The search yielded 2,989 news stories, which were reviewed to determine if they met inclusion criteria (focus on US-associated EVD). The 374 stories that did not place EVD in a US context were included in our analysis of news volume only. The final sample for content analysis included 1,262 news stories and opinion pieces from print and television sources.

Our coding instrument contained 9 risk-elevating messages with characteristics that could increase perception

of risk and 5 risk-minimizing messages with characteristics that could decrease perception of risk (online Technical Appendix Tables 2–4), developed according to the risk perception framework of Slovic (7). To assess interrater reliability, we coded a random sample of 15% of news stories. Most items met conventional standards for adequate reliability; κ values were ≥ 0.69 (10). For 4 items, κ values were slightly below this threshold but raw percentage agreement was high (90%–94%); therefore, these items were also included (online Technical Appendix Table 3). We assessed news story content about the EVD outbreak by calculating the proportion of stories that mentioned each EVD-associated message over the study period.

The volume of US-focused news coverage of the EVD outbreak peaked slightly after the arrival (August 2, 2014) of the first patient transported to the United States for treatment and increased much more after a case was diagnosed in Dallas, Texas, USA, on September 30, 2014 (Figure). Overall, 96% of print and television news stories that covered EVD in the context of the United States included ≥ 1 risk-elevating messages, 55% of stories contained ≥ 1 risk-minimizing messages, and 53% contained both message types. The most common risk-elevating messages (72%) concerned foreigners or travelers bringing Ebola virus to the United States. The most frequent risk-minimizing messages (32%) described scientific knowledge about EVD (Table).

Our analysis of news volume suggested that diagnosis of the first EVD case in Dallas and subsequent cases diagnosed in the United States were influential time points in the escalation of EVD outbreak news coverage, although internationally, the outbreak had reached historic levels months earlier. As noted elsewhere (1,11), the volume of EVD news was largely reduced after the US midterm elections. This reduction may reflect inclusion of EVD as a campaign issue late in the election cycle or may reflect lack of newly diagnosed cases in the United States.

The high frequency of risk-elevating messages in news coverage may have contributed to increased public concern about EVD in the United States, which was greater than the situation warranted. Consumers of news media would have been exposed to risk-elevating messages more often than risk-minimizing messages, potentially increasing their perception of risk for EVD. Risk messages of both types were more frequently included in television news than in print news, potentially leading to differences in perceived

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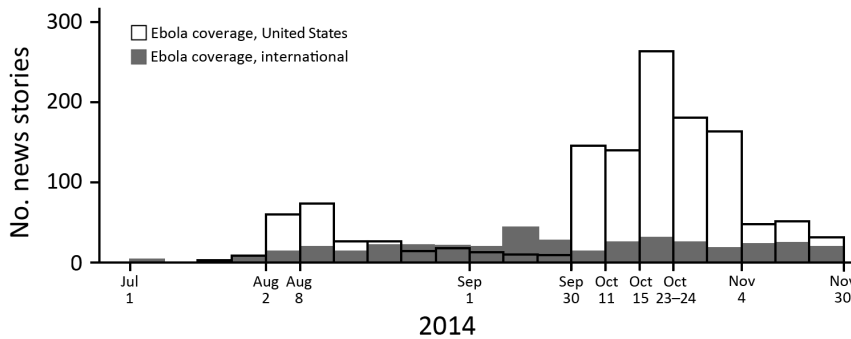


Figure. News coverage of Ebola virus disease comparing stories about Ebola in the United States and internationally, July–November 2014. Aug 2, first Ebola virus disease patient arrives in the United States; Aug 8, World Health Organization declares public health emergency of international concern; Sep 30, first case diagnosed in Dallas, Texas, USA; Oct 11, first case in healthcare worker; Oct 15, second case in healthcare worker; Oct 23–24, case diagnosed in New York, USA, and nurse quarantined; Nov 4, US midterm elections.

EVD risk among consumers of different news types. Although many factors can alter a message's effectiveness, frequency of exposure to risk-related messages can alter public perception and contribute to social amplification of risk; even when coverage is balanced, reassuring messages may be less able to counter messages that increase perception of risk (6,9). However, several messages that were seen significantly more frequently in liberal news sources (defined in Table) may have been associated with increasing awareness of specific issues, such as medical countermeasure development efforts and large-scale growth of the EVD epidemic.

The news media have been blamed for sensationalizing the EVD outbreak in the United States and unnecessarily alarming the public (3). Although the volume of news coverage may have influenced public attention, the content of analyzed news stories does not necessarily suggest that news media were reporting news about EVD in a hyperbolic or irresponsible manner. Comparison of opposing messages, such as the ability to stop transmission or the outbreak in the United States, which was more frequently mentioned than the inability to do so, suggests that some concerns may have resulted from the nature of the risk itself, rather than irresponsible news media coverage. Additionally, messages that were most inflammatory (e.g., science not understanding the disease, inability to stop Ebola in the United States, terrorism/use of Ebola as a bioweapon) were mentioned less frequently than nearly all other messages analyzed.

Although the methods used in this study do not allow for causal inference between news media coverage and public polling about EVD, comparison with public polling may provide useful context. EVD news volume roughly reflected changing levels of concern about EVD (1,12,13). News media coverage could have increased public concern, or public concern could have increased news coverage of risks. Despite widespread coverage of EVD, poll respondents were often misinformed about how the disease was spread; 85% of respondents indicated that a person was likely to get EVD via a sneeze or cough from a symptomatic

person, and 48% believed that transmission could occur before symptoms appeared (14). In our analysis, only 32% of news stories included scientific knowledge such as how the disease is spread. More in-depth and frequent coverage of the scientific aspects (and disease contagion pathways in particular) of a public health threat may prevent these types of misperceptions.

Our results should be considered in light of several limitations. First, the sample did not include all news types (e.g., talk radio, social media, local television, blogs) or international news sources. Furthermore, κ statistics for 4 items in the coding instrument were slightly below conventional reliability standards; however, these messages were either very common or rare, which can result in lower κ agreement (15). These items were thus included because of high raw percentage agreement. Although the process used to create and evaluate the coding instrument should have accounted for risk-elevating or risk-minimizing messages used frequently in coverage of EVD, some risk-related messages may have been unintentionally omitted and the imbalanced number of messages may have influenced our analysis of the overall frequency of message types. Furthermore, trends in news coverage may have been influenced by competing issues in the news cycle. Last, this study does not provide direct measurement of exposure to or influence of messages. Examination of competing messages within news stories and comparison of news sources such as blogs or international sources may be promising areas for future research.

Conclusions

The 2014–15 Ebola outbreak provides a useful case for studying emerging outbreaks and other public health emergencies. Certain risk messages about Ebola were used more frequently than others by US news media, which may have affected risk perception during the outbreak.

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Table. Risk-related news media messages about Ebola virus disease, July–November 2014*

Messages	News stories with message, %						TV, n = 153††
	Print and TV, n = 1,262†	Ebola case/local controversy, n = 655‡	National, no Ebola case/ controversy, n = 607§	Conservative, n = 302¶	Liberal, n = 595#	Print, n = 1,109**	
That could increase perception of risk							
Lack of/limited availability of countermeasures to stop Ebola	17	13	21 (p<0.001)	11	19 (p<0.01)	17	20
Ebola causes deaths	66	64	68	70	65	66	65
Potential US outbreak/persons in the United States contracting Ebola	35	33	36	35	33	34	41
Inability to stop transmission/outbreak in the United States	7	4	9 (p<0.01)	4	6	6	7
Growth of the Ebola epidemic	23	17	30 (p<0.001)	14	26 (p<0.001)	21	36 (p<0.001)
Science does not understand Ebola (e.g., previous knowledge about the disease was wrong or expert advice was incorrect)	8	8	8	7	9	7	13 (p<0.05)
Ebola's potential use in terrorism or as a biologic weapon	1	1	1	1	1	1	1
Ebola has an incubation period	34	34	35	37	33	33	43 (p<0.05)
Foreigners or travelers bringing Ebola to the United States	72	71	74	72	70	71	79 (p<0.05)
That could decrease perception of risk							
Lower Ebola death rates in the United States	5	4	6	3	4	4	10 (p<0.001)
Ability to stop transmission/outbreak in the United States	20	16	24 (p<0.01)	24	17 (p<0.01)	18	30 (p<0.01)
Low risks related to Ebola (e.g., low risk of the disease coming to the United States, low risk of someone transmitting the disease, low risks of school children acquiring Ebola)	28	25	30	25	27	26	42 (p<0.001)
How to prevent spread of Ebola	12	12	13	12	10	11	20 (p<0.05)
Description of scientific knowledge about Ebola (e.g., transmission dynamics or other known aspects of the disease)	32	30	33	29	30	31	35

*Time frame selected to capture potential differences before and after key US Ebola events. χ^2 tests were used to test differences in the proportion of news stories mentioning each Ebola-related message in compared news sources.

†Sources included in all news stories: Atlanta Journal Constitution, Chicago Tribune, CNN Situation Room, Fort Worth Star-Telegram, Fox Special Report, NBC Nightly News, New York Daily News, New York Times, Orange County Register, Portland Press Herald, USA Today, and Washington Post.

‡New sources with an Ebola case or controversy in the locality: Atlanta Journal Constitution, Fort Worth Star-Telegram, New York Daily News, New York Times, and Portland Press Herald.

§Nationally produced news sources or those without an Ebola case or controversy in the locality: Chicago Tribune, CNN Situation Room, Fox Special Report, NBC Nightly News, Orange County Register, USA Today, and Washington Post.

¶Conservative news sources: Fort Worth Star-Telegram, Fox Special Report, and New York Daily News.

#Liberal news sources: Chicago Tribune, New York Times, and Washington Post.

**Print news sources: Atlanta Journal Constitution, Chicago Tribune, Fort Worth Star-Telegram, New York Daily News, New York Times, Orange County Register, Portland Press Herald, USA Today, and Washington Post.

††TV news sources: CNN Situation Room, Fox Special Report, and NBC Nightly News.

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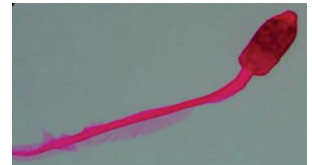
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Technical Appendix

Technical Appendix Table 1. News media sources

Sources*	Regional or National Newspaper†	Liberal or Conservative Ideology‡	Ebola Case or Controversy in the Locality in Which the News Source is Based§
Print			
Atlanta Journal Constitution	South Region	–¶	Ebola Case
Chicago Tribune	Midwest Region	Liberal	–
Fort Worth Star Telegram	South Region	Conservative	Ebola Case
New York Daily News	Northeast Region	Conservative	Ebola Case
New York Times	National	Liberal	Ebola Case
Orange County Register	West Region	–	–
Portland Press Herald	Northeast Region	–	Ebola Controversy
USA Today	National	–	–
Washington Post	National	Liberal	–
Television¶			
CNN Situation Room	–	–	–
Fox Special Report	–	Conservative	–
NBC Nightly News	–	–	–

*Sources were chosen to provide variation in 4 categories: 1) geographic location (U.S. census region); 2) liberal or conservative ideology#; ** 3) localities that experienced Ebola cases or controversies or not and 4) news source type (print, TV). We selected the highest circulation/viewership news sources available in LexisNexis, ProQuest, or Newsbank meeting these non-mutually exclusive criteria.††,‡‡

†Newspaper region was determined by location of news sources in U.S. census regions, with at least one source from each region. Newspapers with national distribution were considered "National."

‡Classification of conservative or liberal ideology was based on endorsement of Democratic or Republican candidates in the 2012 presidential election and viewer clustering around specific news sources according to data collected by Pew Research Center.#, ** Television news sources were selected to provide a potential comparison of information presented to readers or viewers.§§

§Dashes indicate that this news source was not included in either category for this analysis.

¶Although television news sources were headquartered in cities that had experienced Ebola cases, they are nationally produced and focused and were therefore not classified as containing local coverage.

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Technical Appendix Table 2. Messages potentially increasing or decreasing perception of risk*

Ebola-related message	Factors that increase risk perception (Slovic et al.)†
Lack of/limited availability of countermeasures	Disease is not controllable
Potential U.S. outbreak/people in the United States contracting Ebola	Disease is not controllable
Inability to stop transmission/outbreak in the United States	Disease is not controllable
Ebola causes deaths	Disease is fatal
Growth of the Ebola epidemic	Risk associated with disease is increasing
Science does not understand Ebola (e.g., previous knowledge about the disease was wrong or expert advice was incorrect)	Risk is unknown to science
Ebola's potential use in terrorism or as a biologic weapon	Catastrophic and dread characteristic
Ebola has an incubation period	Delayed effect after exposure to the disease
Foreigners or travelers bringing Ebola to the United States	Disease is exotic and unknown
Ebola-related message	Factors that decrease risk perception (Slovic et al.)
Lower Ebola death rates in the United States	Disease may not be fatal
Ability to stop transmission/outbreak in the United States	Disease is controllable
How to prevent spread of Ebola	Risk can be reduced
Description of scientific knowledge about the disease (e.g., transmission dynamics or other known aspects of the disease)	Risk is known to science, observable, and known to those exposed
Low risks related to Ebola (e.g., low risk of the disease coming to the United States, low risk of someone transmitting the disease, low risks of school children acquiring Ebola)	Indicate lowered risks associated with disease

*Following established methodology,‡ an initial coding instrument of messages relevant to risk perception was developed using an informal news media scan then reviewed by two outside infectious disease and public health experts to identify any further risk-related messages about Ebola that they may have observed in their professional roles. The instrument was piloted on 60 news stories from the study time period that appeared in two news sources not included in the study sample (Wall Street Journal, CBS Evening News) and further refined.

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Technical Appendix Table 3. Coding instrument and inter-rater agreement

Basic Coding and Exclusions			
Domain		Coding Scheme	
Coder ID		1 – TKS 2 – CB	
Story unique ID Outlet		1 – USA Today 2 – New York Times 3 – Washington Post 4 – Orange County Register 5 – Atlanta Journal Constitution 6 – Fort Worth StarTelegram 7 – Portland Press Herald 8 – Chicago Tribune 9 – New York Daily News 10 – Huffington Post 11 – NBC Nightly News 12 – CNN Situation Room 13 – Fox Special Report	
Date		DD/MM	
Exclusion 1: Word count		1 – article <100 words 0 – article >= 100 words	
Exclusion 2:		1 – Correction 2 – Book review 3 – Letter to the editor 4 – Solely business/stock 5 – Obituaries 6 – Duplicate 7 – Index only 8 – Introduction/lead in only 9 – Calendar/event report 10 – Advice column 11 – Mentioned in passing 12 – Other (fill in) 0 – News story, health/lifestyle, metro, op-ed/editorial	
Exclusion 3:		1 – International focus/no coverage U.S. related Ebola issues 0 – Includes content about Ebola coming to/in the United States	
Code Only for Included Stories			
Item		Coding Scheme	
Story word count			
Message		Raw Agreement (%)	Kappa Statistic
Message about lack of/ limited availability of countermeasures	1 = yes, 0 = no	96	.84
Message about the disease causing deaths	1 = yes, 0 = no	94	.85
Message about lower death rates in the United States	1 = yes, 0 = no	98	.70
Message about a potential U.S. outbreak/people in the United States getting ebola	1 = yes, 0 = no	87	.73
Message about ability to stop transmission in the United States (positive)	1 = yes, 0 = no	93	.77
Message about ability to stop transmission in the United States (negative)	1 = yes, 0 = no	94	.63
Message about growth of the epidemic	1 = yes, 0 = no	89	.72
Message about low risks	1 = yes, 0 = no	90	.76
Message about science not understanding the disease	1 = yes, 0 = no	94	.67
Message about terrorism or potential use as a biologic weapon	1 = yes, 0 = no	100	.80
Message about how to prevent spread	1 = yes, 0 = no	90	.64
Message about incubation period	1 = yes, 0 = no	96	.90
Message describing science about the risks	1 = yes, 0 = no	93	.83
Message about foreigners, travelers or borders (exotic)	1 = yes, 0 = no	90	.67

Technical Appendix Table 4. Examples of each type of message

Message Types Potentially Increasing Perception of Risk	Example messages
Lack of/limited availability of countermeasures	"The maker of ZMapp has no more of the drug, which was made in small quantities because of its early stage of development." – USA Today, 9/18/14
Potential U.S. outbreak/people in the United States contracting Ebola	"The first diagnosed case of Ebola is sending chills through much of the United States tonight and despite official assurances, there are worries that patient zero in Dallas could be just the beginning." – Fox Special Report, 10/1/14 "We knew a second case could be a reality and we've been preparing for this possibility..." – New York Daily News, 10/13/14
Inability to stop transmission/outbreak in the United States	"Our public health system is not ready to deal with a challenge like Ebola if the situation takes a turn for the worst." – USA Today, 10/2/14 "...yet another day where there were more questions raised about whether the government really has a handle on this." – Fox Special Report, 10/16/14
Ebola causes deaths	"Almost 1,000 people have died of Ebola since March." –New York Times, 8/8/14 "...she was caring for Thomas Eric Duncan. He died Oct. 8 at Texas Health Presbyterian Hospital in Dallas." – Fort Worth Star-Telegram, 10/22/14
Growth of the Ebola epidemic	"The Ebola outbreak could last for years and spread to many more countries if it is not controlled quickly." – USA Today, 9/17/14
Science does not understand Ebola (e.g., previous knowledge about the disease was wrong or expert advice was incorrect)	"...The more this virus circulates in West Africa, Wolf, the greater chance it has of mutating...change in the virus to lead to possibly becoming...aerosol[ized]." – CNN Situation Room, 10/17/14 "We don't actually know with any great precision how Ebola is transmitted." – Fox Special Report, 10/15/14 "We have to rethink the way we address Ebola infection control, because even a single infection is unacceptable," Thomas Frieden, director of the Centers for Disease Control and Prevention, said in a news conference." – Washington Post, 10/13/14
Ebola's potential use in terrorism or as a biologic weapon	"Are you worried that terrorist groups also try to use Ebola as a weapon against the United States? Have you heard anything on that essentially getting sympathetic infected people to specifically travel to the United States in the hopes of infecting others, is that a concern?" – Fox Special Report, 10/3/14
Ebola has an incubation period	"North Texas officially became Ebola-free on Friday when the last of 177 people being monitored because of their exposure moved out of the 21-day virus incubation period with no symptoms of sickness." – Fort Worth Star-Telegram, 11/7/14
Foreigners or travelers bringing Ebola to the United States	"Late this afternoon, Ashoka Mukpo boarded a plane in Monrovia, Liberia. After some nine hours in the air, he'll land in Nebraska and be taken to the Nebraska Medical Center." – NBC Nightly News, 10/5/14 "A man who flew from Liberia to Dallas in September was diagnosed with Ebola on Tuesday..." – Washington Post, 10/1/14
Message Types Potentially Decreasing Perception of Risk	
Lower Ebola death rates in the United States	"Two nurses who helped treat him, Nina Pham and Amber Vinson, later became ill and tested positive for Ebola. They received prompt, specialized treatment and survived...as serious as the threat was to Pham and Vinson, the numbers can be seen as encouraging." – Fort-Worth Star Telegram, 11/7/14
Ability to stop transmission/outbreak in the United States	"We do not anticipate this will spread in the U.S..." –New York Times, 7/29/14 "In the United States, we have a good health infrastructure and effective precautionary standards. Both greatly contribute to creating a formidable barrier against the spread of Ebola in the United States" – Orange County Register, 8/14/14
How to prevent spread of Ebola	"A key element is that no skin can be exposed by doctors, nurses or technicians taking care of a person infected with Ebola, which is transmitted through direct contact with bodily fluids and tissue but is not airborne." Chicago Tribune, 10/21/14
Description of scientific knowledge about the disease (e.g., transmission dynamics or other known aspects of the disease)	Ebola is spread only through direct contact with an infected person's bodily fluids. People are not contagious until the begin showing symptoms." – Atlanta Journal Constitution, 10/2/14
Low risks related to Ebola (e.g., low risk of the disease coming to the United States, low risk of someone transmitting the disease, low risks of school children acquiring Ebola)	"The Centers for Disease Control and Prevention said there was no significant risk to the United States from the outbreak." – New York Times, 8/1/14

Message Types Potentially Increasing Perception
of Risk

Example messages

“Carnival said the CDC had notified it that a passenger on the Carnival Magic was a lab supervisor at the hospital and deemed to be “very low risk.”” – Chicago Tribune, 10/18/14

“Schools Chancellor Carmen Fariña and city Health Commissioner Mary Bassett fired off a letter to school principals, laying out possible Ebola warning signs but emphasizing that the risk to staff and students is “very small.”” – New York Daily News, 10/17/14
