“Facts, Not Fear”: Negotiating Uncertainty on Social Media During the 2014 Ebola Crisis

Kajsa E. Dalrymple1, Rachel Young1, and Melissa Tully1

Abstract
Trust in many government organizations is low, creating a challenging environment for communication during outbreaks of emerging infectious diseases, like Ebola. In a thematic analysis of 1,010 tweets and four Twitter chats during the 2014-2015 Ebola outbreak, we found that the Centers for Disease Control and Prevention emphasized organizational competence, extant protocol, and facts about transmission to manage public fear. We argue that an emphasis on certainty in a rapidly changing situation leaves organizations vulnerable to charges of unpreparedness or obfuscation. Our results also speak to the contested definition of engagement online, particularly during health crises.

Keywords
Ebola, Twitter, public health, infectious diseases, health communication, risk communication, managing uncertainty, crisis communication

The 2014-2015 Ebola outbreak has been described as “one of the biggest risk communication challenges in recent memory” (Baron, 2014). The pace and reach of mass and social media have led to increased public awareness and

1University of Iowa, Iowa City, IA, USA

Corresponding Author:
Kajsa E. Dalrymple, School of Journalism and Mass Communication, Adler Journalism Building, University of Iowa, Iowa City, IA 52242, USA.
Email: kajsa-dalrymple@uiowa.edu
concern about emerging infectious diseases (EIDs) such as Ebola, even when the outbreak occurs far from home (Joffe, 2011). These factors create a highly fraught environment for EID communication, particularly via social media where rumors can spread as quickly as expert-endorsed information.

As the federal agency tasked with fighting disease and protecting national health, the Centers for Disease Control and Prevention (CDC) emerged as the leading official U.S. source of information about the Ebola outbreak. Social media, Twitter in particular, became a frontline method of disseminating information quickly. CDC accounts attracted followers at a rapid pace—going from several thousand followers at the start of the outbreak to nearly 1.6 million in September 2014 (Murphy, 2014). CDC communication officials saw social media as a way for the CDC to emerge as the source for “credible, fact-based” information about the outbreak, and the participatory nature of Twitter was an opportunity to “assess concerns directly, dispel myths about certain issues, and stay in touch with Americans” (Murphy, 2014). However, the affordances of Twitter, including limited space for conveying complex information, also created challenges for the CDC. Criticism of the CDC’s social media response characterized messages as inconsistent, flip-flopping between “Be afraid” and “Don’t be afraid” and as an example of “what not to do” when communicating during a crisis (Cruz, 2014). Polls also indicated that the perceived mishandling of the crisis threatened the credibility and reputation of the CDC, showing a 25% drop in public perception of the effectiveness of the organization since the previous year (Jones, 2014).

The following case study provides an in-depth look at how the CDC, a government health agency, put EID communication into practice on Twitter, a platform that complicates the communication process by enabling rapid dissemination of information as well as continuous public questioning and critique. Drawing from theoretical models of communication proposed in public relations (e.g., the four models of public relations; see Grunig & Hunt, 1984) and crisis communication literature (e.g., the crisis and emergency communication model; see Reynolds & Seeger, 2005), we explored themes in the CDC’s social media messaging about Ebola and examined the use of Twitter for one-way information dissemination and two-way public engagement. Specifically, we conducted a thematic analysis of tweets sent by the CDC’s main Twitter account during the 2014-2015 Ebola outbreak to explore how the organization attempted to manage public uncertainty during an unpredictable epidemic. We focus on the CDC Twitter account to (1) determine how social media may reinforce or complicate existing models guiding public health crisis communication (Grunig & Grunig, 2008; Grunig & Hunt, 1984; Reynolds & Seeger, 2005; Seeger, Reynolds, & Sellnow, 2009; Waters & Jamal, 2011); (2) investigate how social media posts address what is, from
This case study builds on previous research that explores how communication during disease outbreaks occupies a complicated space at the intersection of health, risk, and crisis communication (Abraham, 2011; Holmes, 2008; Reynolds & Seeger, 2005; Seeger et al., 2009) and how organizations use social media for “informational engagement” (Firmstone & Coleman, 2015) in an environment of increased demand for transparency and decreased trust in public agencies (Renn, 2009). To ground our study, we briefly describe how the nature and origins of Ebola magnified public uncertainty, review the literature characterizing the role of uncertainty in EID communication, and discuss how Twitter and other social media platforms may enable or complicate previous recommendations about organizational communication during crises.

Literature Review

Ebola, Risk, and Uncertainty

Ebola hemorrhagic fever is highly fatal, with no cure or treatment. During the outbreak, the CDC noted that “public fear and outrage surrounding Ebola” presented unique communication challenges (CDC, 2015). Based on Sandman’s (1987) formulation of risk as “hazard plus outrage,” Ebola qualifies as a low-hazard, high-outrage risk because it is catastrophic, dreaded, and exotic, even though the quantifiable risk to U.S. citizens is extremely low. Fear or dread of a disease also decreases tolerance for risk (Renn, 2009). Though the public health professional perception of actual risk from Ebola to the U.S. residents was near zero (Harvard School of Public Health, 2014; Murphy, 2014), after the first person diagnosed with Ebola in the United States infected two health care workers, 15% of Americans thought it was very or somewhat likely that they or an immediate family member would get Ebola (Newport, 2014). As with other EIDs, lack of familiarity and personal experience with the disease heightened public uncertainty (Seeger et al., 2009).

Uncertainty exists in all risk scenarios, where details of the situation are often “ambiguous, complex, unpredictable, or probabilistic” (Brashers, 2001, p. 478). Renn (2009) identifies uncertainty arising from the limitations of probabilities to estimate actual events as a key challenge of public conversation about risk. Even in the face of expert confidence about risk estimates, the progression of outbreaks is inherently uncertain due to the many factors and
human systems involved (Seeger et al., 2009). With Ebola in particular, medical understanding of the disease may be uncertain or contingent (Abraham, 2011). Uncertainty also arises from the perceptual shifts between organizational imperatives to maximize public good and the risk perceptions and behaviors of individuals (Fox, 2002).

Public uncertainty complicates risk communication because it often distorts risk calculations provided by experts (Hornig, 1993; Lupton, 1999), particularly, as with Ebola, when the public lacks personal experience with the disease or when public outrage is high (Sandman, 1987). Negative public attitudes and responses may also develop if uncertainty is related to a perceived danger or threat to health or safety. These responses range from heightened anxiety or fear (Brashers, 2001; Goodall & Reed, 2013) to increases in outrage and perceived unfairness (Sandman & Lanard, 2003). Emotional responses to uncertainty may also change when new information is made available or when uncertainty is reevaluated (Brashers, 2001, p. 482).

Patterns in individual emotional reactions to uncertainty present a great challenge to organizations attempting to communicate in situations characterized by public perceptions of risk that are misaligned with risk calculation. In fact, research on managing public uncertainty has found evidence of differing opinions about whether the uncertainty inherent in disease outbreaks should be conveyed at all. Some argue that being honest about uncertainty could earn public trust and that “conveying uncertainty is more reassuring than conveying certainty and being proven wrong” (Holmes, Henrich, Hancock, & Lestou, 2009, p. 799). However, public health practitioners also discuss certainty during outbreaks as conditional—you have to be “as certain as you can be” or focus on “certainty for now” (Holmes et al., 2009). Similarly, scientists may believe that communicating uncertainty about risks could foment distrust or panic (Frewer et al., 2003). The CDC’s own integrative crisis and emergency risk communication (CERC) model is designed to account for these conflicting perspectives and aims to improve the quality of public decision making during crises while encouraging increased public tolerance for uncertainty as the situation evolves (Reynolds & Quinn, 2008).

Managing Uncertainty in EID Communication

While little research has been conducted on how to effectively communicate organizational uncertainty during EID outbreaks, the CERC model (Reynolds & Quinn, 2008) and other risk and crisis communication research have more generally addressed best practices for managing public uncertainty (e.g., Sandman, 1987, 2004, 2015a, 2015b). Here, we focus on three communication strategies employed during health crises to manage uncertainty: building...
trust, disseminating information, and fostering two-way communication (Holmes, 2008; Renn, 2009; Seeger et al., 2009). These three strategies, derived from research on risk communication, crisis communication, and public relations, inform our analysis.

Evaluations of past epidemics, such as the 2001 anthrax outbreak and the 2009 H1N1 swine flu, suggest that precrisis communication is crucial to promote a clear public understanding of the potential threat of a disease and to develop a sense of expertise that will encourage public compliance with organizational recommendations (Reynolds & Seeger, 2005; Seeger et al., 2009). In the past, it was assumed that the public would trust information from government organizations (Holmes, 2008). However, in a society described as “post-trust,” there is public skepticism of the motives of government organizations, which casts doubt on information these sources produce and the actions they take during crises (Abraham, 2011; Gerwin, 2012). Thus, government organizations cannot assume a baseline level of public trust that could act as a cushion during crises. Instead, trust is seen as something to be built and accrued through communication (Gesser-Edelsburg, Mordini, James, Greco, & Green, 2014), primarily, as the CERC model suggests, by conveying information that is accurate and timely (Reynolds & Seeger, 2005).

In order to build trust and develop a sense of expertise among the public, organizations often correct perceptions of uncertainty through information dissemination, described as an “in-fill of facts” (Holmes et al., 2009), especially facts about disease causes and transmission that can help individuals avoid exposure (Rothman & Kiviniemi, 1999). The goal of providing the public with quick and up-to-date information as a method of building trust implicitly supports a “deficit model” of public understanding of risks. The deficit model applies a one-way, top-down communication process in which scientists must learn how to communicate to nonscientists, who then, in turn, listen and learn (Miller, 2004). In EID communication, one-way transmission of communication from experts to the public may be intended not just to inform but also to persuade people to “do what the experts advise” (Holmes, 2008, p. 350). Reliance on one-way, fact-laden messaging to influence passive publics aligns with the traditional public information model of public relations (Grunig & Hunt, 1984). In the public information model, one-way communication techniques, like press releases, emphasize factual information to be relayed through the media, which, in turn, is intended to garner public loyalty to and trust in the organization. Firmstone and Coleman (2015) build on this conceptualization in their discussion of “informational engagement” as the one-way flow of information from expert to public in participatory spaces (p. 692).

In addition to building trust and disseminating information through the media, organizations are instructed to develop two-way feedback systems
where the public can voice concerns (Renn, 2009; Reynolds & Seeger, 2005). The CERC model emphasizes the need for two-way communication tactics when trying to minimize uncertainty during the five stages of an event (precrisis, initial event, maintenance, resolution, and evaluation). Public relations theory distinguishes between asymmetric two-way communication (i.e., soliciting feedback to inform persuasive messages designed to influence audiences) and symmetric two-way communication (i.e., focusing on mutual respect and understanding, as well as potential changes to organizational operations to accommodate public perspectives; Dozier, Grunig, & Grunig, 1995; Grunig & Grunig, 2008). Depending on the stage of the crisis, CERC recommends actions aligned with both symmetric two-way communication, like “alliances and cooperation with agencies, organizations and groups” in the precrisis stage (Reynolds & Seeger, 2005, p. 52), and asymmetric two-way communication, like messaging that facilitates “informed decision making by the public” during the management stage (Reynolds & Seeger, 2005, p. 52).

Symmetric two-way communication is theorized to lead to more mutually beneficial, long-term relationships between an organization and its publics (Dozier et al., 1995; Grunig & Grunig, 2008), which may subsequently increase trust (Engdahl & Lidskog, 2014; Gesser-Edelsburg et al., 2014; Heath, Bradshaw, & Lee, 2002; Sellnow, Ulmer, Seeger, & Littlefield, 2008). However, past research suggests this strategy is not deployed frequently on social media during disease outbreaks (Waters & Jamal, 2011). Despite the CERC emphasis on integrating one-way and two-way communication (Reynolds & Seeger, 2005), follow-up reports assessing CDC and WHO communication during the H1N1 pandemic described messaging that primarily relied on one-way information dissemination (Gesser-Edelsburg et al., 2014). In particular, the CDC assessment of its own H1N1 communication stated that the emphasis was not on engagement or interaction but on using multiple channels to convey one-to-many information (Gesser-Edelsburg et al., 2014).

**EID Communication Via Twitter**

Considering these challenges, social media sites are attractive to crisis communicators because they enable both one-way and two-way communication, making concerns about engaging the public more salient because symmetrical two-way engagement is at least theoretically possible. Twitter is the second most popular social media platform for marketing (Stelzner, 2015), and scholars define Twitter as a key source of news, information, and sharing during crises (Schultz, Utz, & Göritz, 2011; Utz, Schultz, & Glocka, 2013). Twitter is used to circulate valuable information, such as where to go for emergency assistance (Muralidharan, Rasmussen, Patterson, & Shin, 2011),
as well as rumors and false information as people try to make sense of complex and quick-changing situations (Mendoza, Poblete, & Castillo, 2010). Additionally, disseminating information through Twitter allows organizations to access groups beyond those directly connected to the organization, through retweeting and the use of hashtags. In fact, research indicates that during times of crisis, social media users look for hashtags that result in the most rapid feed of information and then rely on those hashtags to find situational updates (Lachlan, Spence, Lin, Najarian, & Del Greco, 2016). If organizations, like the CDC, can develop or co-opt a popular hashtag, users are more likely to follow the organization for direct updates (Lachlan et al., 2016). From a research perspective, Twitter is particularly interesting because of the potential for an organization’s messages to reach a broad audience of both active publics, who are directly connected to an organization and motivated to learn more, and latent publics, who are affected by an issue but not actively involved (Kim & Grunig, 2011).

Despite the two-way design of Twitter and other social media sites, most organizations focus on one-way communication in disseminating their message during health crises, rather than interacting with users (Chew & Eysenbach, 2010; Muralidharan et al., 2011; Waters & Jamal, 2011; Waters & Williams, 2011). For example, Muralidharan et al. (2011) found that non-profit organizations used social media extensively during the 2010 Haiti earthquake but did little to promote two-way interaction. Instead, they focused mostly on information dissemination and disclosure, particularly via Twitter, where 61.6% of tweets were “updates on the relief efforts” (p. 176). Additionally, Twitter’s 140-character limit forces messages to be short and direct, not allowing for detailed content or background information, which can be especially challenging when communicating about complicated science or medical topics.

This one-way communication is not limited to crisis events but rather is typical of organizational use of social media (Waters & Williams, 2011). In their study of Twitter use by U.S. government agencies, Waters and Williams (2011) found that agencies “primarily relied on one-way communication that sought to inform and educate rather than two-way symmetrical conversations” (p. 353). The @ symbol and retweets (RTs), two common Twitter conventions used for two-way communication, are used by organizations as a means of pseudo- or indirect engagement rather than as a means of sustaining conversations. Again, this type of communication aligns with the public information model of public relations, in which organizations rely on one-way communication of factual information, despite the opportunity for two-way communication that Twitter affords (Grunig & Hunt, 1984; Waters & Williams, 2011).
Twitter chats, scheduled live events organized by a predetermined hashtag (e.g., #journchat, #SportsPRchat) and usually moderated by a group or individual, are increasingly popular ways to organize and direct conversations on Twitter (Cooper, 2013). The CDC organizes chats using #CDCchat to encourage questions and conversations about specific health topics. These types of guided dialogues are the evolution of asking people to participate in other directed ways, such as submitting questions for virtual town hall meetings and participating in online forums (Waters & Williams, 2011), and give the impression that organizations are interacting and engaging with constituents. At the same time, however, Twitter chats have a much lower barrier to participation when compared to traditional town hall settings and, therefore, have greater potential to attract a group of individuals with a wider variety of interests, attitudes, and demographic characteristics. The ability to participate online, asynchronously, or anonymously may encourage some participants to voice concerns and questions, but participation is limited to those with access to the Internet and a Twitter account.

As the CDC emerged as a leading official source of information about the Ebola outbreak, its Twitter accounts became a primary channel of communication with the public and mass media sources. Considering this, we closely examined tweets from the CDC’s main Twitter account to explore types of communication (e.g., one-way information dissemination, two-way asymmetric or symmetric) that the CDC used to manage public uncertainty, convey organizational uncertainty, and address the informational needs specific to the Ebola crisis. We also analyzed the organization’s interaction with individuals in four hosted Ebola Twitter chats, described by the CDC as opportunities for increased public engagement (Murphy, 2014). Our goal was to investigate how uncertainty management strategies identified in risk and crisis communication models such as CERC—specifically building trust, disseminating information, and engaging publics—are deployed on social media during an EID outbreak.

**Method**

**Sample**

The data for this study include tweets from the official CDC Twitter account (https://twitter.com/cdcgov) from March 1, 2014, to December 31, 2014, and four CDC Twitter chats. This time range includes the start of the Ebola outbreak, which began in Guinea in March 2014, as well as the CDC’s reaction to the cases diagnosed in the United States in October 2014. All original tweets and retweets from the CDCgov Twitter account were retrieved using
multiple “Get” requests via Twitter’s API (application programming interface) using the CDCgov username (user_id). Due to download limitations, only 300 tweets could be downloaded per request, making multiple requests necessary to compile the complete data set of 2,625 tweets sent during the study period.\(^1\) The tweets were then coded as either containing content about Ebola or not relevant to Ebola. After removing the non-Ebola tweets, our final data set contained a census of 1,010 @CDCgov tweets, including messages retweeted by @CDCgov from other CDC accounts (e.g., @CDCEmergency), beginning with the first tweet on April 1, 2014, a week after the CDC announcement about the outbreak in West Africa.

Additionally, the CDC hosted four “CDC chats” on Twitter related to the Ebola outbreak. These chats were promoted on Twitter and organized using the hashtag #CDCchat. Chats were presented as opportunities for the public to ask questions to CDC experts responding to the Ebola outbreak. Each chat lasted 1 hour. In our analysis of the #CDCchats, we include CDC comments and responses to public questions (\(n = 475\)) in order to analyze the CDC’s efforts to engage publics in two-way communication (Grunig & Hunt, 1984). The CDC archived chats using Storify, an online curation tool.\(^2\) Our findings include only CDC comments and responses that were archived by the CDC on Storify. The Storify includes all questions that were answered by the CDC during the chat but excludes public questions or comments that were not directly addressed. Examining Storify narratives allows us to investigate themes in CDC responses within this participatory space and aligns with our goal of investigating how organizations choose to engage in two-way communication during health crises. Because of our primary focus on themes in communication from the CDC, we did not formally code the public tweets from the CDC chats. However, these tweets may be included in the results to provide context for our analysis of CDC responses.

Analysis

Data were analyzed using an iterative, constant comparative process to identify themes within the CDC’s Twitter messaging (Boeije, 2002; Glaser, 1965; Strauss & Corbin, 1990). First, the three authors open-coded a subset of 400 CDC tweets, purposefully selected to represent a range of times within the analysis period. We began analysis with one deductive concept, managing uncertainty, which was identified based on a review of the literature on risk and crisis communication during health crises. Other inductive concepts related to managing uncertainty emerged during open coding (Glaser & Strauss, 1967). After open coding the subset of tweets, the authors discussed and refined initial codes and grouped codes into themes, all related to the
Table 1. Summary of Findings.

<table>
<thead>
<tr>
<th>Theme</th>
<th>Sample tweets</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Signaling trustworthiness</td>
<td>We know how to stop #Ebola from spreading CDC doesn’t recommend people on same commercial airline flights w/ #Ebola patient undergo monitoring [link]</td>
</tr>
<tr>
<td>IA. Involvement as expertise</td>
<td>Over 50 CDC experts now on the ground battling #Ebola in W. Africa; hundreds of US CDC staff working 24/7 in support CDC #DiseaseDetective Dominique’s unique skills came in handy working on #Ebola in Guinea</td>
</tr>
<tr>
<td>IB. Reliance on protocols and procedures</td>
<td>CDC has protocols in place to protect against further spread of the disease CDC has protocols to ensure safe transport and care of patients w/ infectious diseases, incl #Ebola, back to US</td>
</tr>
<tr>
<td>2. Isolating risk</td>
<td>It is safe to go to public places. #Ebola poses no significant risks to the US RT @DrFriedenCDC: We can’t get to zero risk in U.S. until we stop the #Ebola epidemic at its source in Liberia, Sierra Leone, &amp; Guinea</td>
</tr>
<tr>
<td>3. Informational engagement</td>
<td>@EbolaWatchUSA #Ebola is only spread by direct contact w/ bodily fluids of infected person w/ symptoms #CDCchat #Ebola hemorrhagic fever is a rare &amp; deadly disease caused by infection with one of the ebola viruses #CDCchat</td>
</tr>
</tbody>
</table>

Note: CDC = Centers for Disease Control and Prevention.

primary concept of managing uncertainty: signaling trustworthiness, isolating risk, and informational engagement (see Table 1 for themes and relevant examples). When coding the complete data set, the authors continued to reference previously coded content in order to further refine themes (Glaser, 1965). During both rounds of coding, all tweets were coded by at least two researchers in order to strengthen the validity of our analysis. Disagreements between coders were resolved through discussion, which led to more careful refinement of our themes.

The tweets and interactions included in the findings below are representative of the major themes derived from our analysis. Tweets appear as they were written with two exceptions: We have removed URL strings and replaced with [link] to indicate that a website link was provided, and we have
removed personal identification of all tweets sent from non-CDC accounts. We have made no changes to spelling or grammar.

**Results**

*Signaling Trustworthiness*

In accordance with a previously articulated emphasis on managing uncertainty through building trust (Holmes et al., 2009; Reynolds & Quinn, 2008), tweets from the CDC sought to establish credibility by signaling organizational competence, American exceptionalism, and the efficacy of established public health routines and protocols. Tweets positioned the CDC as a national and global authority on Ebola. Even if the content of knowledge or the basis for expertise was not articulated, the organization’s experience was characterized as sufficient to overcome the current outbreak. Tweets also emphasized that the CDC’s understanding of the disease was comprehensive and crucial to the outbreak response: “CDC’s unparalleled knowledge of Ebola—how it spreads, how it kills, how to find it & how to stop it—supports the WHO’s growing West African response.”

The organization’s expertise was also signaled in tweets that offered recommendations for action or behavior, such as, “CDC advises against educational travel” to West Africa. Even tweets that directly acknowledged that the outbreak was concerning or frightening, countered that admission with emphatic statements that the CDC could overpower Ebola: “The spread of #Ebola in West Africa so far shows us how difficult this outbreak will be to control—but we can control it.” One tweet quoted CDC Director Tom Frieden as saying, “While the disease is scary, ‘the plain truth is we can stop Ebola’ [link].” These messages, seen particularly in the early months of the outbreak, emphasized that the CDC had expert knowledge that served as the foundation for the response.

*Involvement as Expertise*. Evidence of CDC expertise was also provided through numbers that defined the scope of CDC involvement and reference to the efforts of CDC field epidemiologists, called “Disease Detectives.” The numbers emphasized the scale and scope of the CDC’s involvement in the outbreak. When aid workers infected with Ebola returned to the United States, tweets signaled the preparedness of the American health system at large: “42 state and local labs are currently able to diagnose #Ebola. Learn more [link]” and “35 U.S. hospitals currently designated as being ready to treat a patient with #Ebola. [link].”

Disease Detectives, officers in the Epidemic Intelligence Service, are described on the CDC website as “elite global health sleuths” who identify
the causes of outbreaks and prevent diseases from spreading. Messages emphasized the commitment of CDC staff in the field: “@DrFriedenCDC: CDC staff working 7 days a week under very difficult conditions to help get #Ebola outbreak under control. We’ll stay at it,” or crafted metaphors of Disease Detectives as soldiers who were “boots on the ground.” The majority of tweets, however, gave the first names of staffers to emphasize individual expertise, determination (“#CDCintheField from Monique: In the fight against #Ebola, we won’t be stopped by the rainy season in Guinea [link]”), and confidence (“#Ebola battle is a winnable one, CDC #DiseaseDetective Dan says. He just returned from Sierra Leone. Read his story. [link]”). Disease Detectives were portrayed as the embodiment of the organization’s competence, expertise, and heroism.

Protocols and Procedures. The CDC also sought to establish trust in the methods used to combat outbreaks. In the face of an uncertain path forward for an unpredictable disease, the CDC emphasized that established public health procedures and protocols were sufficient to combat Ebola. An emphasis on procedure and protocol could be seen as a dispassionate, empirical corrective to public fear or misperception of risk: “#EbolaOutbreak important reminder we cannot let fear of unfamiliar overtake a reasoned approach to infectious disease control.”

Early tweets emphasized the effectiveness of CDC’s protocol for infection control. Tweets plainly stated, “Any U.S. hospital following CDC’s infection control recommendations can safely manage a patient w/Ebola hemorrhagic fever.” The failure to quickly diagnose the first Ebola patient in the United States and the subsequent infection of two health care workers directly countered these claims, and the CDC’s seeming failure to offer enough guidance to local hospitals became a political talking point. Rather than address criticisms directly via Twitter, the CDC emphasized human error in executing protocol: “Infection in Texas linked to breach in protocol: RT @ DrFriedenCDC: Health workers caring for #Ebola patients can do so safely but it requires meticulous adherence to infection control protocol.”

In short, the CDC used Twitter to promote expertise and build trust by emphasizing the organization’s competence, using the Disease Detectives as exemplars of expertise, and stressing the value of following established procedures and protocols, even when they failed.

Isolating Risk

Uncertainty magnifies perception of risk, and communication from health officials and experts is often seen as a corrective for any mismatch between
actual risk and outsized perceptions of potential harm (Hom, Plaza, & Palmén, 2011). CDC tweets minimized risk to U.S. residents with explicit statements that diminished the risk, with contentions that this outbreak was no different from past outbreaks that were ultimately controlled, and by emphasizing distance between West Africa and America and later between individual U.S. cases and the rest of the country.

Both in responses to individual tweets and in tweets to its followers, the CDC emphasized that Americans were not at risk from Ebola. The CDC stated unequivocally that “chances of an #Ebola outbreak in the United States are extremely low.” Some tweets diminished risk by emphasizing relative risk from other infectious diseases, an argument that was also seen in mass media coverage: “U.S. residents are much more likely to get seasonal #flu than Ebola. Learn more: [link]. #getafluvax.”

Risk also was diminished through assertions about the exceptional nature of U.S. health care and via comparisons of West Africa to the United States. U.S. systems were defined as exceptional in comparison to West African health systems, which were often described as insufficient for handling the outbreak. CDC tweets about Ebola made the somewhat contradictory contentions that an Ebola outbreak could not happen in the United States but, if it did, it would be swiftly dispatched: “RT @DrFriedenCDC: We will stop #Ebola in its tracks here in the US: Here’s why [link] @ CNNOpinion.” Tweets from the CDC director and Disease Detectives “on the ground” in Africa describe tough road conditions, lack of beds in Ebola units, and risky burial practices that position the region, its infrastructure, and its culture as distant from the United States. One exception to the characterization of African systems as broken down was the case of Nigeria, portrayed as a “positive deviant”: “RT @DrFriedenCDC: Nigeria’s extensive response to a single case of #Ebola shows control is possible with rapid, focused interventions [link].”

Finally, the conversation about risk often focused on inflated public perception of health risks, such as anxiety about Ebola when an outbreak in the United States is extremely unlikely. However, public health organizations sometimes depend on public perception of risk to justify action and involvement in disease outbreaks that are geographically distant (Hamblin, 2015). This contradiction between diminishing perceptions of risk but not extinguishing it entirely is reflected in the CDC tweet: “#Ebola poses very little or no risk to the US community at large, but CDC & healthcare providers in the US need to be prepared.”

A public that has no knowledge of Ebola or no fear of the disease may not understand why an agency tasked with protecting the health of Americans is sending aid to West Africa. One way to justify CDC involvement in foreign
health crises is by describing how U.S. assistance can help prevent the outbreak from affecting health stateside. Early on in the Ebola outbreak, CDC tweets used the term global health security to emphasize that resolving the outbreak in West Africa was necessary not only on humanitarian grounds but also to protect Americans, linking the safety of Americans directly to the outbreak in Africa: “RT@DrFriedenCDC: The only way to protect the health security of America & world is stopping #Ebola’s spread in W. Africa [link].” While many tweets sought to minimize perception of risk among U.S. residents by explicitly stating risk was low, expressing confidence in U.S. health care, or making comparisons with West Africa, some depiction of risk seemed necessary to justify CDC involvement.

“Informational Engagement”

Rather than acknowledge uncertainty, even when protocols seemed to fail and information changed, CDC tweets often emphasized what was known about Ebola. Considering that these “fact blasts” increased after the first U.S. case, repetition of facts was used not just to inform but also to counter public concern. In retweeted remarks from late October, President Obama emphasized, “It’s critical that we remain focused on the facts and on the science” and that “facts, not fear” should govern public response to Ebola. Facts about disease transmission were reiterated to assuage concerns. A tweet about transmission, “Ebola is spread by direct contact w/ bodily fluids of a sick person or exposure to contaminated objects, like needles [link],” had more than 4,000 retweets.

One especially interesting point is how frequently facts were used to answer questions about risk and how often the public pressed for greater detail and certainty. On four occasions during the study period, the CDC hosted Twitter chats with “Ebola experts,” perhaps as an effort to address suggestions from Stage 3 in the CERC model to encourage feedback from affected publics in order to correct misunderstandings or rumors. Three chats were designed for the general public, and one was promoted directly to health care workers. These nominal participatory spaces operated not as conversation but as opportunities for clarification—what Drake (2006) calls “the deficit model in disguise” (p. 390). Public demand for consistent and certain answers to specific questions also placed the CDC in an uncomfortable position when those questions could not be answered or when the answer was uncertain. Responses often skirted the question by answering with a vague statement about the virus and its behavior or reiterating the effectiveness of public health protocols:
Person 1: @CDCgov sir, can #Ebola virus be contacted through handshake? #CDCchat

CDC: #Ebola is transmitted by contact with bodily fluids. #CDCchat

Person 2: What are the actual chances of Ebola becoming widespread in the United States? #CDCChat

CDC: @Person 2. With hard work & vigilance, US medical system & public health can contain sporadic cases from spreading widely. #CDCchat

One potential drawback to answering these questions is that information can seem contradictory over time. For example, questions were repeatedly raised about whether the disease could become airborne or how long the virus persisted. In two chats occurring 6 days apart, the CDC offered the following answers to various questions about how long the virus could survive:

#Ebola can live on surfaces for several hours. See [link] for more information. #CDCchat

#Ebola on dry surfaces can survive for several hrs. Virus in body fluids can survive up to several days at room temp. #CDCchat

Fluids of a dead person are extremely contagious & Ebola lives in bodily fluids on surfaces for a very long time. #CDCchat

#Ebola is a wimpy virus that does not survive in the environment for an extended period of time. #CDCchat

While each tweet is an accurate answer to a discrete question, taken together, these responses seem to contradict each other.

When individuals notice these contradictions, it can be grounds for criticism. For example, chat questions sometimes became critical, asking, “@CDCemergency: press conference said symptomatic people aren’t contagious; travel guidance on CDC site suggests otherwise. What gives?” Other criticisms on Twitter highlight the complicated nature of engagement. In a rare instance of using questions to solicit comments outside the context of the chats, the organization asked, “You’ve met several CDC DiseaseDetectives fighting #Ebola in W. Africa. If you could ask them 1 question about their work, what would it be?” Of the 26 responses, most suggest CDC ignorance, incompetence, or ill intent: “@CDCgov if Ebola is not airborne how are all these workers getting infected,” “Why does CDC own patent on Ebola “invention?” Known as “EboBun” Patent No. CA2741523A1 Vaccines, Profits [link],” and “Why did u let Doctor Sheik Umar Khan die? Why didn’t
he receive the serum like the two WHITE Americans did? Black vs white bodies?” CDC interactions on Twitter demonstrate the difficulty of operationalizing and managing engagement during crises. Posing questions invited criticism and derision, and tweets from the public were not seeking engagement in the sense of dialogue or conversation but rather were probing for concrete information to assess personal risk.

Discussion

Our results highlight the way that social media both simplifies the process of communicating risk to a large audience and complicates the development of effective and clear messages during times of crisis and uncertainty. Specifically, the themes that emerged in how the CDC managed uncertainty on Twitter illustrate the complex and sometimes contradictory task of conveying facts and managing fears at the collision of health, risk, and crisis communication. We found that in a rapidly changing situation, CDC tweets emphasized organizational competence, extant protocol, and facts about transmission. The CERC model suggests that public health organizations manage uncertainty during crises by providing background information and establishing credibility in the early stages of a crisis (i.e., one-way communication), then correcting misinformation (i.e., one-way communication), engaging stakeholders, and gaining support during the maintenance phase (i.e., symmetrical two-way communication). However, our study highlights the difficult nature of distinguishing among these phases in an outbreak with no predictable beginning, middle, and end. Events such as the transmission of Ebola from a patient to health care workers serve as bifurcations or “flashpoints of change” (Vanderford, Nastoff, Telfer, & Bonzo, 2007, p. 22) that require rapid redirection on social media. Applying established models may also be complicated by the affordances of social media platforms, including space limitations, persistence, and forwardability of content. Finally, although the CDC made an effort to engage in two-way communication by encouraging feedback from their audience through Twitter chats, the participatory space of social media was used not for dialogue but rather for top-down communication in which experts offered advice and answered risk-based questions from individuals (Drake, 2006). An emphasis on eliciting feedback to persuade audiences to adopt a viewpoint beneficial to the organization (e.g., the Ebola outbreak could easily be managed by extant protocol) fits with the definition of asymmetric, rather than symmetric, two-way communication.

Our analysis also yields insights about EID communication that can be applied to other circumstances. First, an emphasis on certainty in a chaotic and uncertain situation may leave an organization vulnerable to charges of
unpreparedness or obfuscation when an emphasis on protocol is, perhaps inevitably, at odds with the inherent uncertainty of epidemics and human behavior. In addition, the need to tamp down public perceptions of personal risk directly contradicted the need to emphasize the potential for national risk as a means of justifying intervention. The fact that concerned individuals and the CDC perceived risk at different levels—personal risk versus public health risk—created an additional disconnect.

Despite warnings from risk communication scholars about the dangers of overconfidence (Sandman, 2004), CDC tweets did little to convey organizational uncertainty. From the beginning of the outbreak, the CDC stepped in as the authoritative, official voice about Ebola. Especially early on, tweets conveyed authority and trustworthiness, and insistence on the effectiveness of protocols continued even as hospital workers became infected stateside. It is unclear whether the seeming reluctance to convey uncertainty was an organizational choice or a limitation of the message platform, as Twitter’s 140-character limit forces brief statements that limit the ability to include conditions or equivocations. Whatever the origin, organizational overconfidence led to a magnified public “adjustment reaction,” a temporary overreaction to perceived risk, when pronouncements about minimal risk were seen as contradicted by actual events in the United States (Sandman, 2015a).

Also, while many messages downplayed risk to Americans, portrayal of Ebola as a threat to global health security seemed necessary to justify government involvement in a distant crisis. The fulcrum of this risk-perception balancing act in relation to EIDs is described “an appropriate level of concern, enough to inspire necessary support for preparedness without causing panic” (Hamblin, 2015). CDC tweets seemed to try to reach this balance over time rather than all at once. Their efforts followed an arc that began with drumming up attention and demonstrating the importance of the U.S. role in managing the outbreak, moved to building public trust and tamping down risk as fears swelled, then to emphasizing certainty about transmission, and transitioned into directly answering public concerns about individual risk.

As discussed, symmetric two-way communication is a common imperative in crisis communication recommendations, and social media enables it. However, the difficulty of operationally defining what constitutes engagement and confusion about what the public desires from dialogic communication during outbreaks makes putting this recommendation into practice challenging (Firmstone & Coleman, 2015). Repeatedly, in the CDC chats individuals posed questions about disease characteristics, symptoms, and progression, such as, “How high is the fever for someone with Ebola?”; “At what point in incubation is person infectious to others?” and “Can Ebola survive on sterile surfaces for 6 days?” The nature of these inquiries calls into
question assumptions about what the public wants from organizational dialogue and engagement during health crises.

Offering links to CDC Web pages, fact sheets, and infographics was common in CDC tweets, which served to direct followers to more information. While this strategy overcomes the limitations of Twitter's character limit and provides potential valuable resources for information seekers, it does little to provide two-way symmetric engagement with individuals. Twitter users seemed primed for information from the CDC. One Twitter chat, described by the CDC not as conversations but as opportunities to ask questions (Lee, 2014), was promoted with tweets from all the CDC accounts that yielded 900 retweets. During the same chat, the CDC received 4,580 tweets in an hour, from 1,670 participants, resulting in thousands of shares of the CDC’s Ebola parent page, an indicator of success if success is defined as attracting attention (Grunig & Hunt, 1984; Lee, 2014). Chats could also be seen as another opportunity for clarification as people sought more detailed information about disease transmission. It is unclear whether fact-based questions were really the plurality or whether these questions were selected by the CDC because of their topic and tenor, which would speak to gatekeeping processes on social media, where some questions are addressed and many others are ignored. This trend may also speak to the CDC’s reliance on asymmetric two-way communication strategies during the outbreak. Rather than engage in an actual conversation with their audiences, the CDC may, in fact, rely on chat experiences as a way to promote directed persuasive messages through the guise of engagement. Considering this, a hashtag analysis of #CDCchat around that time period would illuminate the organization’s filtering process and the presence of symmetric two-way versus asymmetric two-way strategies.

Hamblin (2015) describes the role of government officials at the apex of the Ebola panic as “largely to quell undue paranoia.” The public seemed to consider the disease as more of a threat than highly infectious and endemic diseases, such as flu or measles, what research on risk would characterize as a mismatch between perceived and actual risk (Hom et al., 2011). Some of this fear is due to the horrific nature of the disease, but some of it is also due to its origins in Africa. However, news media also contributed to the “othering” of Ebola and West Africans infected with the disease through text and visuals depicting bodies in the streets or emphasizing conspicuously foreign practices such as traditional burials with loved ones washing the body of the deceased or the consumption of infected bush meat (Seay & Dionne, 2014). After Ebola outbreaks in the mid-1990s, British “lay thinkers” conceived of Ebola as a terror from science fiction, remote and fantastical, as a way of amplifying the distance between themselves and the disease (Joffe & Haarhoff, 2002). Tweets contrasted the on-the-ground experience of the
outbreak in Africa, described as seeming like a movie, with the Disease Detectives positioned as the heroes, with assurance that American health systems were equipped to manage Ebola, if it ever crossed our borders.

Despite CDC efforts, trust in the agency decreased during the Ebola outbreak (Jones, 2014). Lack of organizational trust could be based on skepticism that the CDC response to the disease was politicized rather than based solely on scientific evidence or due to a perceived lack of expertise for understanding the disease, lack of experience in combating the disease, or lack of preparedness. The CDC director was harshly criticized for his early handling of the crisis, particularly his failure to effectively address the crisis when two nurses contracted Ebola even though they followed the CDC protocol: the same protocol that Frieden and the organization had insisted would ensure the ability of any U.S. hospital to safely treat Ebola patients (Vox, 2014). The organization took an “ignore approach” to criticism after initially suggesting that any failure of protocol was the fault of individuals implementing it, a failure of compliance rather than of instruction. Recitations of the absolute certainty in protocols, particularly for tasks that involve interpreting and applying directions in emotionally intense crisis situations, left the CDC open to criticisms of overconfidence and incompetence.

These themes suggest a relationship fraught with uncertainty and an unwillingness to broadcast uncertainty to the public, perhaps rooted in the fear that the public cannot handle or manage uncertainty without panicking and that any admission of uncertainty could diminish public trust in the organization (Frewer et al., 2003). Inevitably, the public desire for absolute certainty is at odds with the nature of both medicine and crises. Anthony Fauci, Director of the National Institute of Allergy and Infectious Disease, captures the challenge of explaining rarity in risk: “One of the problems in biology is that—unlike mathematics or physics where someone can tell you the exact odds of something happening or not—you never say never, and never say always” (Hamblin, 2015). Fox (2002) describes this as the “inevitable uncertainty” of medicine, in which “certainty for now” stands in for absolute certainty as evidence accrues. This reality poses serious challenges for organizations trying to engender trust through recommended symmetric two-way strategies. Considering the uncertain nature of EIDs, it is possible that public perception of fear outweighs an interest in developing trust through symmetric two-way engagement. As a result, messages signaling trustworthiness through protocol and expertise and constructing an illusion of certainty may not be as effective as merely acknowledging what is known, what is probable, and what is unlikely (Sandman, 2004). Considering these challenges, future research should investigate how social media can best be employed to convey organizational uncertainty as well as trustworthiness and competence.
As is true of any case study, our results are limited in both scope and generalizability. By using an inductive and iterative approach to analyzing CDC tweets, we were cognizant of models used to guide past crisis communication (Seeger et al., 2009) but did not simply fit content and themes into an existing framework. Instead, we discovered a number of trends that provide insights into how health organizations use social media to manage the public perception of uncertainty and how well those tactics match the suggestions of existing risk and crisis communication models. Additionally, because the goal of our analysis was to explore the themes in depth, we did not record quantitative data regarding the frequency of themes. Moving forward, we intend to investigate how social media messages from the CDC and other organizations are forwarded or altered by individuals and organizations on social media to better understand information flows and the role of expert information during outbreaks. We also intend to explore how organizational responses to critical comments influence other followers and chat participants. It is possible that responding to “hostile” comments about Ebola on social media platforms could actually increase perception of competence among portions of the public who are uncertain about organizational performance and could also alert organizations to errors sooner (e.g., Sandman, 2015b).

Another primary goal of future research on EID communication is interrogating assumptions about uncertainty, particularly the relationship between expressions of uncertainty and perceptions of source credibility, as well as how this relationship is modified when the baseline level of trust in the source is low, as with many government organizations. Risk communication guidelines already suggest transparency in acknowledging rather than ignoring uncertainty (Sandman & Lanard, 2003), but organizations may be wary of making uncertainty public when trust is low and criticisms prevail on social media. Interviews or surveys with government communicators will help further our understanding of how organizations define effective communication during disease outbreaks and negotiate uncertainty in creating a collective voice for an organization on social media. Finally, in addition to acknowledging uncertainty inherent in outbreaks and in medicine, future research should explore the attitudinal effects of acknowledging rather than ignoring or diminishing public fear, as well as the benefits or drawbacks to more proactively using social media to engage in symmetric two-way communication strategies as a method of addressing criticisms or misconceptions, in opposition to the “ignore approach” seen here.

In a New England Journal of Medicine editorial, Bill Gates (2015) said, “The only good news from the tragic Ebola epidemic . . . is that it may serve as a wake-up call,” catalyzing preparations for future disease epidemics more infectious than Ebola. This analysis of CDC tweets and interactions allows
subtleties in the organization’s communication to emerge, complementing quantitative analyses of terms and sentiments online and offering insight into the challenges of public communication during uncertain times. Our findings may be of particular interest to practitioners and organizations faced with communicating about EIDs in a competitive media landscape. As the CDC has struggled to regain public trust since the Ebola outbreak, another EID outbreak has flooded the news cycle. In fact, research regarding the Zika outbreak is already pointing to the important role that mass and social media are playing in directing the dialogue about the disease.

In their recent study, Southwell, Dolina, Jimenez-Magdaleno, Squires, and Kelly (2016) show that in this heightened state of uncertainty, news coverage of public health organization announcements regarding Zika is influential in stimulating subsequent public information searching and sharing behaviors online. These findings, integrated with our own, highlight the important role that public health organizations can play in shaping public perception of risk during a crisis event. However, our analysis reveals a complicated and often contradictory relationship with managing uncertainty. Although previous literature recommends building trust through symmetric two-way engagement with the public, it is possible that asymmetric two-way strategies, where the organization is engaging with the public for the purpose of developing persuasive messages, and even one-way messaging through a media outlet may be more effective in reducing public uncertainty about EIDs via social media. In instances where the EID has particularly frightening symptoms and outcomes, such as Zika and Ebola, the public may be less interested in working with the organization to reduce uncertainty (as suggested in the two-way symmetric model) and more interested in informational engagement that focuses on eliminating their sense of fear (Firmstone & Coleman, 2015). Considering this, future empirical research exploring how participatory media might enable or disrupt the flow of information during health crises will be crucial in developing more effective organizational communication that is both trusted and responsive to public concern.

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Notes
1. More information about this process is available on the Twitter development page: https://dev.twitter.com/rest/reference/get/statuses/user_timeline

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**Author Biographies**

**Kajsa E. Dalrymple** (PhD, University of Wisconsin–Madison) is an assistant professor in the School of Journalism and Mass Communication and a faculty associate of the Water Sustainability Initiative at the University of Iowa. Her research explores the relationships between strategic communication, social influence and behavior change.

**Rachel Young** (PhD, University of Missouri) is an assistant professor in the University of Iowa School of Journalism and Mass Communication. Her research investigates the role of social media and other user-generated digital content in public health communication.

**Melissa Tully** (PhD, University of Wisconsin–Madison) is an assistant professor in the School of Journalism and Mass Communication at the University of Iowa. Her research focuses on digital media, civic and online engagement, and media literacy.