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Maria Elena Figueroa

To cite this article: Maria Elena Figueroa (2017) A Theory-Based Socioecological Model of Communication and Behavior for the Containment of the Ebola Epidemic in Liberia, Journal of Health Communication, 22:sup1, 5-9, DOI: [10.1080/10810730.2016.1231725](https://doi.org/10.1080/10810730.2016.1231725)

To link to this article: <https://doi.org/10.1080/10810730.2016.1231725>



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Published online: 30 Aug 2017.



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A Theory-Based Socioecological Model of Communication and Behavior for the Containment of the Ebola Epidemic in Liberia

MARIA ELENA FIGUEROA

Johns Hopkins Center for Communication Programs, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland, USA

The Ebola virus disease that emerged in the West African countries of Liberia, Sierra Leone, and Guinea in 2014 created an unprecedented public health emergency that caught national and international organizations off guard. Despite available guidelines to respond to public health emergencies, coordinated action to control the disease only came almost 6 months after what is now considered the first human contact with the virus. Theory-based frameworks, like the ideation model and the pathways framework, are important tools for guiding research and the design of communication activities and strategies to effectively impact on the more likely determinants of the intended behavior. By using theory, these frameworks increase the chances that localized research and communication interventions can effectively change desired behaviors and their behavioral determinants. In an outbreak situation such frameworks are all the more important, when time is of the essence and lives are on the line.

The Ebola virus disease (EVD) that emerged in the West African countries of Liberia, Sierra Leone, and Guinea in 2014 created an unprecedented public health emergency that caught national and international organizations off guard. Despite available guidelines to respond to public health emergencies such as the EVD outbreak (Centers for Disease Control and Prevention, 2012), coordinated action to control the disease only came almost 6 months after what is now considered the first human contact with the virus. The purpose of this article is to describe how theory-based frameworks were used during the 2014 EVD outbreak and how they can be used in other emergency settings to facilitate and accelerate planning when time is short and the need for an effective initial response is acute.

According to the Centers for Disease Control and Prevention, every emergency, disaster, or crisis evolves in phases (Reynolds, 2002): the (a) *precrisis phase*, which involves the preparation of a potential response; (b) *initial phase*, when the outbreak occurs and confusion can emerge; (c) *maintenance phase*, when clarifying risk perceptions and correcting misinformation occurs; and (d) *resolution phase*, when the emergency recedes and lessons are learned. Within each of these phases, communication can play crucial roles in enhancing preparation and response efforts to such emerging

threats. Communication activities within each phase may include some of the following:

1. *Precrisis phase*: Although rarely seen as such, the absence of an emergency is an opportunity to prepare and produce a communication strategy with developed and tested messages; articulate communication protocols; identify available communication resources; define the roles and responsibilities of various actors, including communities themselves; identify and develop strong stakeholder relationships and collaboration; and build trust with key players (including first responders). Building trust is an essential process that needs to start in anticipation of any potential threat. Identifying resources (health workers, local leaders, youth groups, schools, and others) at the community and neighborhood levels to create two-way communication networks can help to spread accurate and timely information during an emergency and reach even remote areas. These same networks can be organized as feedback or dialogue mechanisms to hear from communities promptly so that emergency responses can be tailored to specific needs and adapted as the threat evolves.
2. *Initial phase*: Characterized by confusion and intense media interest, this phase needs accurate and prompt information, but as demonstrated by the 2014 Ebola outbreak, information is often incomplete in this phase and rumors and misinformation can quickly overtake accurate facts. If a communication strategy is already developed, it already will have identified credible communicators or spokespersons who are accepted and trusted by stakeholders. These spokespersons, generally public information officers, should be trained—ideally before the crisis—in public health emergency communication techniques so that they can maintain the consistency of message content and prevent further misinformation from becoming a source of distrust.
3. *Maintenance phase*: As the crisis evolves and more information becomes available about the threat, two-way communication

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Address correspondence to Maria Elena Figueroa, Johns Hopkins Center for Communication Programs, Johns Hopkins Bloomberg School of Public Health, 111 Market Place, Baltimore, MD 21202, USA. E-mail: mfiguer1@jhu.edu

channels and networks allow responders to listen to stakeholders and gather audience feedback. A dialogue can develop, making it easier to identify and expeditiously communicate and correct misinformation in order to help the public accurately understand the risk it faces. Communication during this phase needs to consider that people at this stage may feel anxiety, sadness, numbness, denial, anger, hopelessness, and grief.

4. *Resolution phase*: As the threat comes under control, communities are usually more responsive to risk avoidance and mitigation communication, and the opportunity for gathering lessons about what worked best arises at this stage. During this phase, communicating with stakeholders to inform them about the control of the threat and acknowledging the collective effort to overcome it becomes relevant. Assessing how the response worked and what things and resources should have been in place to expedite the response but were not, can help responders refine their strategy (communication materials, coordination, etc.) and advocate for such resources. In this phase, the opportunity also arises to identify, recognize, and consolidate initiatives, local leadership, and community action that emerged during the response and that can support future efforts.

Organization of the Ebola Communication Response

There is widespread agreement that the response to the 2014 outbreak was slow to gear up (Medicins Sans Frontiers, 2014; Moon et al., 2015). As a result, organized risk communication during the first two response phases (the precrisis and initial phases) was inadequate and failed to keep pace with the rapid speed at which the epidemic developed. Delayed response resulted in a misinformed public; fear and mistrust; and a lack of well-equipped, informed, and trained health providers to adequately treat the ill. In the midst of this scenario in August 2014, the United States Agency for International Development (USAID) requested that the Health Communication Capacity Collaborative (HC3) project join the international response that was trying to curb the spread of the disease, which had reached unprecedented levels.

With a chaotic environment and with cases surging every day, time to organize was limited. Expectations and motivation for effective actions were high, but the prospects for a systematic approach were still not clear. In the face of this challenge, and as staff began deployment to Liberia, even the smallest bits of information about EVD became valuable but insufficient to develop a communication strategy that could positively impact and control the epidemic.

Behavior Change, the Only Viable Intervention

Unlike for many other diseases, it soon became clear that there was no vaccine for Ebola and there was no drug to treat the disease. This meant that the most important interventions needed to be focused on preventing infection and on the behaviors that were responsible for the spread of the virus.

In any public health scenario, theories and frameworks of health communication and behavior are useful tools for identifying potential determinants that influence behavioral decisions and actions that can be used to develop effective communication strategies. One

such framework that has been applied to multiple health areas across different regions of the world is the ideation model (Kincaid, 2000; Kincaid, Delate, Storey, & Figueroa, 2012). The model represents “a metatheory of health communication that summarizes the contribution of a wide range of communication, social and behavioral change theories and their interrelationships” (Kincaid et al., 2012, p. 307). It identifies a set of psychosocial variables grouped into three domains that have been shown to have a direct, often complementary and cumulative, influence on health behavior change. The three domains are (a) *cognitive determinants* of behavior, such as attitudes toward and perceived norms about the recommended behavior, perceived risk (of infection), and self-efficacy to protect oneself and/or others from the disease; (b) *emotional determinants*, such as feelings of fear, trust, and compassion (toward the ill and the recovered); and (c) *social influence determinants*, such as social support to practice the recommended behavior or peer pressure to avoid it and interpersonal communication with others about recommended practices. Research has shown that the more of these elements that come into play in a given setting, the greater the likelihood of practicing a recommended behavior (Babalola, 2007; Kincaid, Storey, Figueroa, & Underwood, 2006; Ricotta et al., 2015). The most recent version of the ideation model is presented in Figure 1.

The ideation framework provided a useful lens through which to examine factors that might lead to effective preventive behaviors. The process of using this framework to develop a strategy involved, first, identifying the preventive or protective behaviors that needed to be addressed through communication and, second, trying to map the ideational variables that potentially influence such behaviors. Although the ideation model was a useful tool for thinking about the various domains that could be at work in the EVD epidemic, the task proved to be bigger than expected.

Three categories of behaviors were initially identified as necessary for curbing the spread of the disease:

1. Prevention behaviors, such as personal care (washing hands with soap and clean water; avoiding playing/eating/touching bats; avoiding contact with bodily fluids, clothing, bedding of infected persons) as well as isolation of the sick and safe burials for the dead.
2. Care-seeking/caregiving behaviors, including monitoring symptoms and seeking care as soon as symptoms appeared and having access to services and prevention/hygiene supplies, such as knowing the hotline number at which care could be requested and having access to clean water and soap.
3. Case identification/reporting behaviors, which comprised reporting to community taskforces, leaders, or the hotline if contact with an Ebola-infected person had occurred.

For each of these behaviors, the HC3 research team tried to identify relevant ideational variables through reports from people in the field, rapid surveys using cell phone technology (see Berman, Figueroa, & Storey, 2017, in this same supplement), and other information sources from organizations working in the field.

Table 1 provides an example of the types of ideational variables that were identified for two specific behaviors that were critical to the containment of infections, namely, isolating the sick and safe burial of the deceased.

While this ideation-based matrix was being developed it became evident that controlling the epidemic required communication

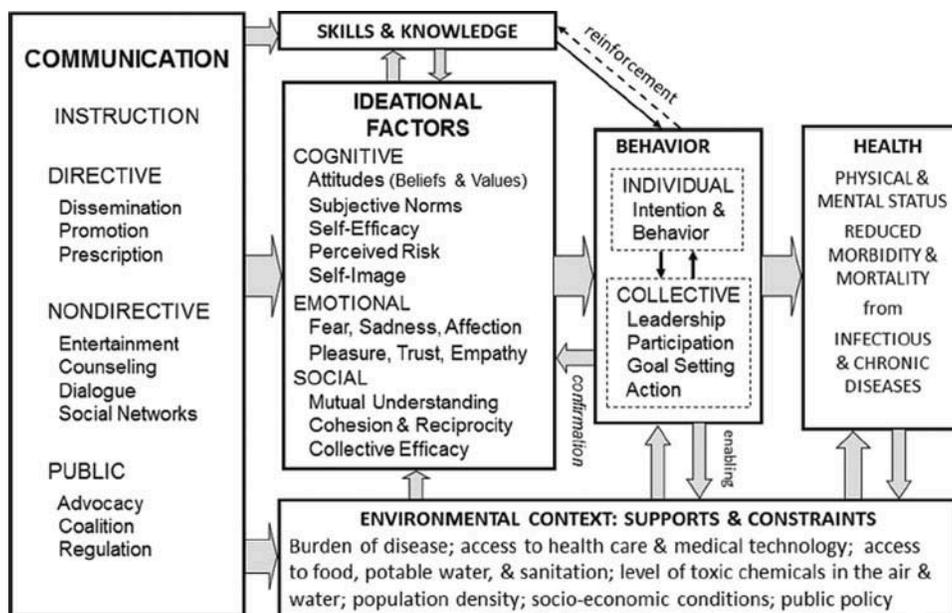


Fig. 1. A metatheory of health communication (Kincaid et al., 2012).

Table 1. Ebola conceptual matrix: Example of individual-level factors identified for two prevention behaviors—isolation of the sick and safe burials, October 2015

Behavioral outcome: Prevention	Ideational variables					
	Knowledge/skills	Beliefs/attitudes	Perceived risk/susceptibility	Self-efficacy	Response efficacy	Perceived norms
Isolation of the sick	<ul style="list-style-type: none"> Stay 1 m away from sick people/bodies^{a,b} 	<ul style="list-style-type: none"> Attitudes toward infected people (stigma) 		<ul style="list-style-type: none"> Confident to isolate infected family members 	<ul style="list-style-type: none"> Isolation works to prevent infection to others 	<ul style="list-style-type: none"> Cultural practices regarding caring for the ill
Safe burial	<ul style="list-style-type: none"> People who die from Ebola are highly contagious Avoid touching the clothing, bedding, and personal belongings of dead persons Stay 1 m away from Ebola dead bodies Call HWs to assist with safe burial and handling of the body^c and clean the home of the dead person Do not return home until HWs clean the house Go with HWs to funeral site Avoid sharing food or drink and communal washing of hands during funeral rites Delay funeral feasts until the disease crisis has abated (document from MOHSW instructs no funerals or rituals—this may be difficult ...) 	<ul style="list-style-type: none"> Attitudes toward HWs (trust) Beliefs about the use of chlorine, smell, other effects (generally accepted for cleaning) 		<ul style="list-style-type: none"> Confident will call HWs to handle burial and house cleaning Confident to avoid communal washing and sharing practices at burials 	<ul style="list-style-type: none"> Agrees HWs' process is effective to prevent further infection Agrees avoiding communal burying practices is effective to prevent infection 	<ul style="list-style-type: none"> Cultural practices regarding burials Thinks others will accept/are handling burials through HWs Any norms/cultural practices regarding the use of chlorine?

Note. HW = health worker; MOHSW = Ministry of Health and Social Welfare.

^aBodily fluids include the blood, saliva, urine, stool, sweat, vomit, and semen of the infected person. ^bEbola symptoms include (a) early symptoms (can appear from 2 to 21 days after exposure): fever, severe headache, joint/muscle pain, sore throat, chills; and (b) more severe symptoms: nausea and vomiting; diarrhea (can be bloody); red watery eye; rash (red bumps); chest pain/cough; stomach pain; severe weight loss; bleeding, usually from the eyes; near dead bleeding from the nose, rectum, ears. ^cSafe burial includes bury promptly, as soon as is possible; bury in 2-m-deep grave.

interventions to address levels higher than the individual, namely, community and normative level factors that could influence the desired behaviors, service-level factors that provided critical resources for the ill, and policy-level factors to guide a coordinated response within a very limited timeframe. These policy factors were crucial for developing and consolidating collaboration at multiple levels in record time so as to mobilize existing resources to control a disease that showed no signs of abating.

A Social Ecological Model for Ebola Prevention and Control

To address these higher levels of social organization beyond the individual, we turned to the pathways framework developed for the USAID-funded Health Communication Partnership (2002–2007) project. The pathways framework is a pioneering socioecological approach to communication interventions for health behavior change that integrates various models developed by the Research Division at the Center for Communication Programs, including models for community dialogue and social change (Figueroa, Kincaid, Rani, & Lewis, 2002; Kincaid & Figueroa, 2009), models for service delivery and performance improvement (Kim, Kols, Bonnin, Richardson, & Roter, 2001; Kim, Putjuk, Basuki, & Kols, 2003; Storey, Boulay, Karki, Heckert, & Karmacharya, 1999), and the ideation individual behavior change model (Kincaid, 2000). The framework proposes four domains of communication that have been

shown to jointly impact social and behavior change: the policy domain, the service delivery domain, the community domain, and the household and individual domain. The model is a powerful tool that helps communication and development practitioners identify, within each domain, the potential motivators and barriers that impact health behavior change. By identifying these factors within each domain and validating them with evidence from a particular setting, communication practitioners and researchers can prioritize areas of intervention and research across domains so to increase program effectiveness. The model structure implies a pathway or sequence of effects leading from the communication intervention (defined by local conditions), to initial theory-based outcomes, to behavioral outcomes, and ultimately to desired health outcomes (Kincaid, Figueroa, & Underwood, 2002; Pollock & Storey, 2012; Storey, Kaggwa, & Harbour, 2008). The pathways framework has been used in multiple countries in Africa, Asia, the Near East, and Latin America and adapted to address multiple health outcomes, including reproductive health, HIV prevention, care and treatment, chronic diseases, water and the environment, tobacco control, water and hygiene, and others.

Figure 2 presents a pathways framework developed specifically for the Ebola prevention and control response. The last column in the model presents the desired health outcomes. The preceding column identifies key behavioral actions that need to take place for an integrated communication response within each of the four domains. The middle column lists key determinants of behavior within each

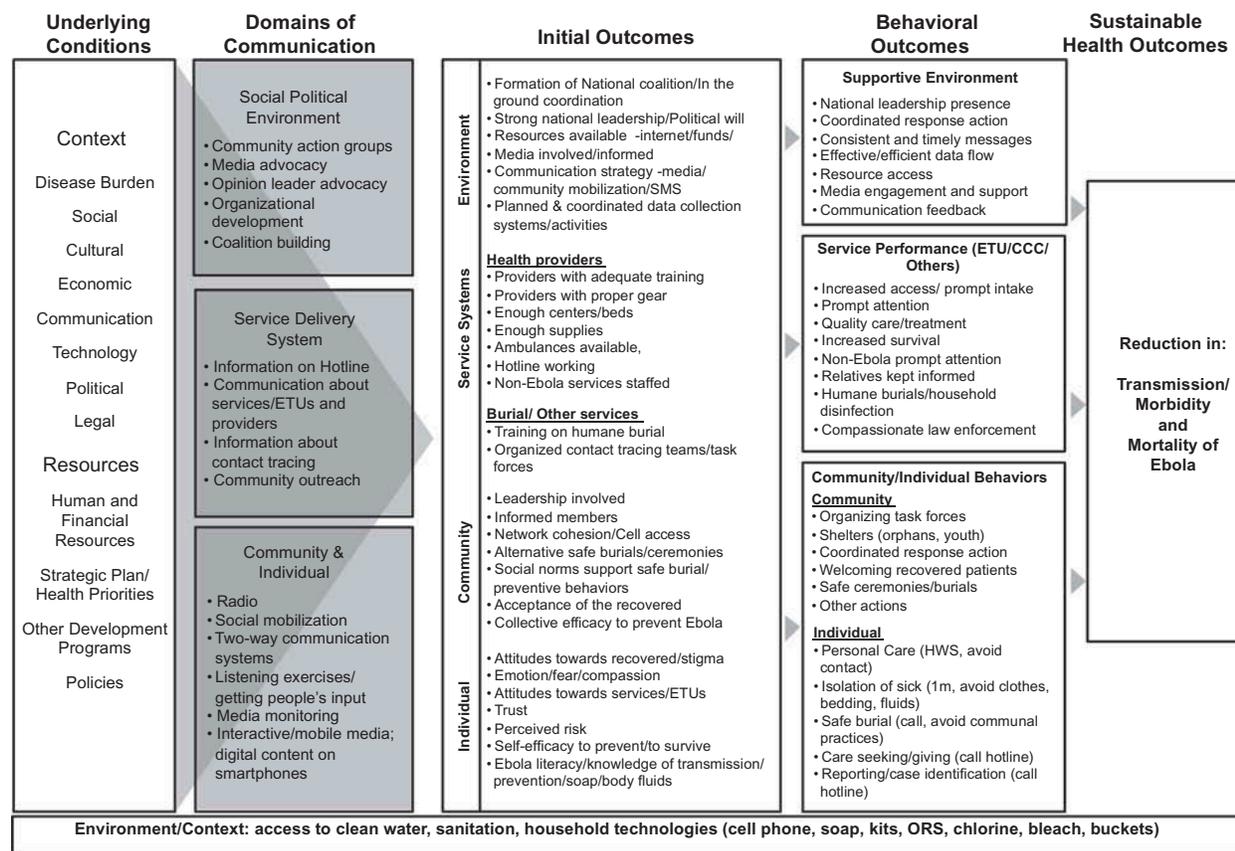


Fig. 2. Pathways conceptual framework for Ebola prevention and control (adapted from Kincaid et al., 2002). ETU = Ebola Treatment Unit; SMS = short message service/text messages; CCC = Community Care Center; HWS = hand washing with soap; ORS = oral rehydration solution.

domain that could be addressed by communication efforts to increase the probability of changing the desired behaviors. For example, at the policy level, the framework includes the coordination of communication messages by spokespeople at the highest levels of the national response; within the service delivery domain, the behaviors of burial and contact tracing teams were added to reflect critical aspects of effective and compassionate service provision; within the community domain, the role of local leaders in gaining community support for changes in traditional burial practices is highlighted, among other factors; and within the household and individual domain, distancing and preventing contact with infected individuals is a key behavior to address.

The second column in Figure 2 indicates some types of communication activities that took place during the 2014 Ebola response and that might be considered for other similar scenarios as well. The model proved to be an effective tool that helped the HC3 team support the planning and coordination of efforts to expedite an effective response at a moment when there was little time to pause and reflect on the best ways to overcome such dire challenges.

Conclusion

The 2014 Ebola epidemic left thousands dead in West Africa and many lessons learned that national and international organizations have tried to document and disseminate to prevent or mitigate other similar tragedies. Tools that already existed for use during public health emergencies have been revised and organized to make them more widely available for preparedness efforts taking place in other regions worldwide. Theory-based frameworks, like the ideation model and the pathways framework, are important tools for guiding research and the design of communication activities and strategies. They make planning more efficient by suggesting plausible causal mechanisms that can be validated to have an impact on the more likely determinants of the intended behavior. The pathways framework developed for Ebola prevention and control under the HC3 project was recently included in the USAID-funded Ebola Communication Preparedness Guide, which will offer guidance to national and local stakeholders on how to integrate communication into their own preparedness agendas. By using theory, these frameworks increase the chances that localized research and communication interventions can effectively change desired behaviors and their behavioral determinants. In an outbreak situation such frameworks are all the more important, when time is of the essence and lives are on the line.

Acknowledgments

Amanda Berman and Emily Ricotta from the Center for Communication Programs assisted in the preparation of the conceptual matrix shown in Table 1, which included the participation of multiple individuals.

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