Communicating effectively with vulnerable populations during water contamination events

Phyllis A. Nsiah-Kumi

ABSTRACT

Water contamination events are a public health concern worldwide with significant potential to impact the global community. When communicating with the public during these crisis situations, it is vital to consider the multiple audiences who receive the messages. Before developing or delivering messages to a particular community, it is essential to be familiar with the community's characteristics, needs, concerns, and who is considered credible to that community.

Vulnerable populations are those with difficulties in comprehension or accessibility that may limit their full understanding of risks and may mitigate the effectiveness of public health strategies. Vulnerable populations include, but are not limited to, the urban/rural poor, those who are mentally ill, intellectually disabled, medically vulnerable, at the extremes of age (children and the elderly), racial/ethnic minorities, and those with low literacy or limited English proficiency.

A water contamination event poses a unique opportunity to work with diverse populations to effectively convey important health messages. Each population needs to receive appropriate public health messages. Becoming familiar with vulnerable populations and their needs prior to a water contamination event will help in identifying barriers and developing and refining effective messages in such a crisis. In water contamination crises, our publics' health depends on effective, targeted crisis communication.

Key words | communication, public health, targeted messages, vulnerable populations, water contamination events

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INTRODUCTION

Water contamination events are a public health concern worldwide. In 1988, the water supply of Camelford, North Cornwall in the UK was accidentally contaminated with aluminum sulfate when a substitute worker inadvertantly deposited the compound into the wrong tank at the water treatment facility. Approximately 20,000 individuals were exposed to aluminum, lead and other chemicals. Communication about the event and the potential health risks was fluctuating and, at times, contradictory and caused significant concern among the citizens of that community. In addition to the immediate health effects of the exposure, the health impact of this event is potentially ongoing, as nearly two decades later many citizens of the community have ongoing health concerns that they attribute to the event (McMillan *et al.* 1993; Powell *et al.* 1995; Altmann *et al.* 1999; Exley & Esiri 2006). In Bangladesh, over 20 million have been exposed to drinking water contaminated with naturally occurring arsenic at levels over 50 μg/l (Smith *et al.* 2000). In June 2007, radioactive water contamination was discovered at a nuclear power plant site in North Carolina. The source of the contamination has not yet been identified. However, the contamination is believed to be contained within the confines of the plant, and local residents have been reassured that there is no cause for concern (Snow 2007). In situations like these, where the health of many is threatened by water contamination, clear, timely communication

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regarding the nature of contaminants, potential risks to health and recommendations for action is essential.

Whether contamination events result from biological, chemical or radiological threats, it is clear that they are a significant public health concern that requires a timely and appropriate response, and they have the potential to significantly affect the health of the public. Investigation of the contamination, containment of the contaminant and prevention of future incidents are essential components of an effective risk management plan (Covello 2005). While these traditional strategies are an excellent framework, it is essential that effective communication strategies be implemented as part of the overall risk management strategy. Effective communication with the public before and during such events is crucial. Without it, confusion, anxiety and panic can ensue. Additionally, without effective communication, the public is not able to take risk-reducing actions in a timely fashion, thus potentially increasing the negative impact of the contamination on the health of the community. When communication breaks down during contamination events, it can cause significant harm beyond that of physical health. Psychological effects may be a major component of the adverse health effects of contamination events, including somatoform disorders and anxiety-related disorders which are believed to play a role in the ongoing morbidity in Camelford (Hunter & Reid 2005).

CASE STUDY: COMMUNICATION FAILURE IN A WATER CONTAMINATION EVENT

One of the largest water contamination events in the United States occurred in Milwaukee, Wisconsin in 1993. An outbreak of *Cryptosporidium* occurred, resulting in significant morbidity and mortality. Numerous consumers raised concerns regarding water quality and many reported to local health care providers with symptoms of infection. However, it was a full two weeks before the contamination was identified as the cause of the problem. During this event, the primary means of communication with consumers (and sometimes between agencies) was the media. Consumers were not made aware early that a potential contamination was occurring.

At that time the city of Milwaukee did not have a coordinated disaster communication plan. A review of the situation suggests that several significant communication breakdowns occurred on many levels, and consumers from multiple communities were overlooked in this event. After that event, the city of Milwaukee changed its emergency response practices. A broad, diverse public notification strategy was developed using tiered approaches so that no one would be left out. Now, pre-established channels of communication are used to send special advisories to targeted audiences, and community resources are identified in advance. This strategy could have mitigated the effects of the contamination event. Many hospitalizations, deaths, many dollars of lost wages and many days of lost time from work and school as well as several lawsuits could have been avoided had a more effective communication strategy been in place before the contamination event occurred (US EPA 2004).

While relatively recent events such as the Milwaukee *Cryptosporidium* contamination and North Carolina tritium contamination highlight the importance of effective crisis communication, communication has long been recognized as a crucial, but often overlooked, component of environmental crisis planning (Groves & Pearce 1979). Clear communication is essential in any situation in which an intentional or unintentional water contamination event poses a specific risk to the health of the public. A clear plan for communication is an essential component of crisis preparedness. While it is essential to reach all segments of the population, it is imperative to target vulnerable populations in the development and delivery of messages during a public health crisis (McGough *et al.* 2005; Hsu *et al.* 2006).

The objectives of this brief review are to discuss basic principles of effective health communication campaigns, define vulnerable populations, identify potential barriers to effective communication with these populations and recommend strategies for communicating effectively with vulnerable populations during water contamination events.

BASIC PRINCIPLES FOR EFFECTIVE HEALTH COMMUNICATION CAMPAIGNS

Health communication campaigns

Early models of communication describe communication as a fairly linear process, involving the information source,

message, messenger, sent signal and received signal (Figure 1; McQuail & Windahl 1993). While this model recognizes that there may be some interference that impacts the message, models of this nature neglect the fact that communication is a dynamic process with the sender and receiver interacting, and the messages being modified based on these interactions. The most effective health communication messages are audience-centered (Albrecht & Bryant 1996; Kreuter & McClure 2004).

Health communication is "the study and use of communication strategies to inform and influence individual and community decisions that enhance health" (Arkin 1989). It is included among the Healthy People 2010 campaign's focus areas (US Office of Disease Prevention and Health Promotion 2003). Health communication can influence behavioral changes in individuals, groups and communities. It is a tool for promoting or improving health. Health communication can increase an audience's knowledge and awareness of a health issue problem or solution, prompt action, refute myths and misconceptions, and strengthen organizational relationships. It can also affect change among individuals, organizations, communities and society as a whole. While health communication is a valuable tool, it must be used effectively to achieve maximal impact. The most effective campaigns are effective in defining the goal, defining the audience, creating messages, pretesting and revising messages and materials, and implementing campaigns.

It is essential that the messages delivered are relevant to the intended audience, are appropriate to their norms and expectations, and speak to their experiences. The message must be delivered by a source that is credible to the audience, be it a celebrity, local public health official or respected community member (Arkin 1989). The impact of trust, credibility and respect cannot be underestimated in health-related interactions with vulnerable populations

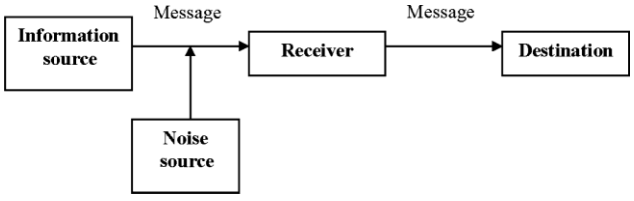

Figure 1 | Linear model of communication (adapted from McQuail & Windahl 1993).

(Peters *et al.* 1997; Boulware *et al.* 2003; Blanchard & Lurie 2004).

Clearly, the process of planning, developing and implementing effective health communication messages is not a brief one. Thus, it is important that those who are charged with communicating with the public during times of water contamination events prepare in advance. Holding focus groups and testing a variety of different messages with community groups prior to a water contamination event may be a very useful strategy for communicating most effectively during the crisis moments. Additionally, working with community leaders to develop, evaluate and refine messages can ensure that they have been evaluated within a subset of the specific population before they are released to the general community.

Risk communication and crisis communication

Prior to a water contamination event, risk communication is useful to alert and prepare the public for an impending risk. Risk communication is an interactive process of exchange of information and opinion among individuals, groups and institutions. It often involves multiple messages about the nature of risk or expressing concerns, opinions or reactions to risk messages or to legal and institutional arrangements for risk management (US Department of Health and Human Services 2002; Aakko 2004).

In a water contamination event, crisis communication is necessary. The key to effective crisis communication is preparedness before a crisis occurs (Reynolds & Seeger 2005). While the goal of risk communication differs based on the nature of the situation, the overarching goals of risk communication are: knowledge and understanding, trust and credibility, and cooperation and construction of dialogue (Covello 2005).

The World Health Organization has presented a five-step process for communicating with the public during crisis situations (WHO 2001). The process includes strategy development, needs assessment, communication mechanism selection, message transmission, and communication monitoring and development (Figure 2). Inherent in the process is a dynamic process of communication involving the public health community, medical community and drinking-water professionals. Figure 3 demonstrates that

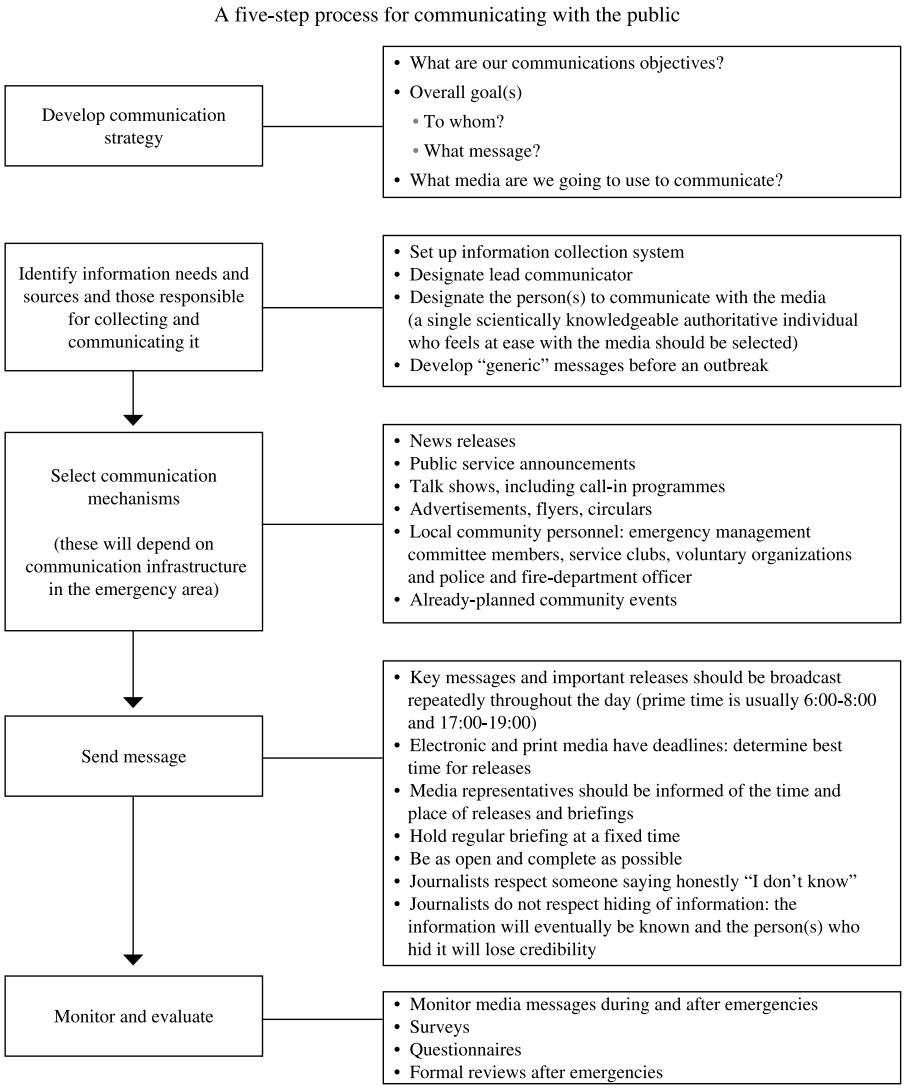

Figure 2 | WHO guidance for communicating with the public in public health crisis situations.

water consumers/patients are central to this discussion (Meinhardt 2003).

In addition to the WHO guidance, Seeger describes ten best practices in crisis and risk communication; they are listed in Table 1 (Seeger 2006). While it has been suggested that these practices are useful for message construction (Venette & Bhattacharya 2006), these practices are difficult to implement and rarely accomplished (Sandman 2006). Additionally, little existing research or practice has focused on the communication needs of vulnerable populations in public and environmental health crisis situations, such as water contamination events (Littlefield *et al.* 2006; Venette & Bhattacharya 2006). Within the proposed framework, pre-crisis planning and fostering partnerships with the public are among the practices that can serve to include vulnerable populations in risk and crisis communication.

Behavioral theory and health communication

Behavioral theory plays an important role in the development of effective messages that motivate recipients to undertake particular actions or change their behaviors. Outbreaks of water-related illness can be avoided if consumers can be motivated to undertake health-protective

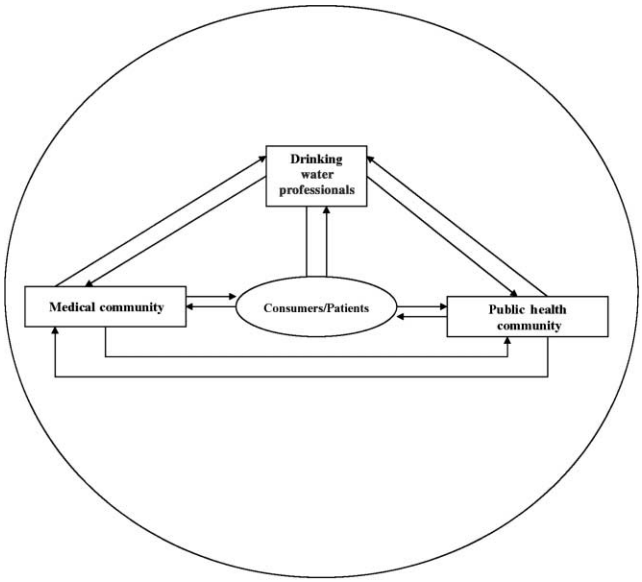

Figure 3 | Channels of communication during a water contamination event (adapted from Meinhardt 2003).

behaviors during a contamination event (Doria *et al.* 2005). While there are numerous types of messages that can be utilized to motivate individuals to undertake particular health-protective behaviors, health campaigns often use fear appeals to communicate health risk messages. The Extended Parallel Process Model is an excellent theoretical framework for examining how individuals respond to fear appeals (Witte *et al.* 2001). Fear appeals are persuasive messages that emphasize the harmful consequences of not following a health message's recommendations.

Table 1 | Ten best practices in crisis and risk communication. 2004 National center for food protection and defense

1.	Risk and crisis communication is an ongoing process
2.	Conduct pre-event (pre-crisis) planning
3.	Foster partnerships with public
4.	Listen to public's concern and understand audience
5.	Demonstrate honesty, candor and openness
6.	Collaborate and coordinate with credible sources
7.	Meet the needs of the media and remain accessible
8.	Communicate with compassion, concern and empathy
9.	Accept uncertainty and ambiguity
10.	Provide messages of self-efficacy

This model developed by Witte *et al.* suggests that health risk messages initiate two cognitive appraisals in message recipients–one appraisal of threat and the other appraisal of the efficacy of the recommended response. First, it is essential to determine if the threat is relevant and significant. If it is determined that the threat is both relevant and significant, the next appraisal is of one's ability to carry out the recommended action (self-efficacy) and the efficacy of the proposed response (Hale & Dillard 1995; Witte *et al.* 2001). After these appraisals, one of three responses follows: no response, a danger control response–to reduce the negative consequences the message depicts, or a fear control response–to reduce the emotion of fear (Figure 4).

For example, the fear appeal message is delivered: "Your water may be contaminated, placing you at risk for serious illness, requiring hospitalization. Boiling water will kill parasites and protect you from *Giardia* infection". Individuals then determine the severity of and their susceptibility to the threat: "Are parasites/*Giardia* infection serious? Could they affect me?". If the message recipients perceive that *Giardia* infection is not serious, or they are not at risk, there is no response. If individuals determine that the answer to both questions is yes (i.e. they perceive a relevant and significant threat), they then decide if boiling water will be effective in preventing *Giardia* infection and if they are able to boil water. If they: (1) deem the problem to be significant and relevant, (2) consider boiling water to be an effective action and (3) are able to boil water, they then enter danger control mode and will boil water. If they perceive the problem to be serious, but are unable to boil water, or believe that boiling water will not make a difference, they enter into fear control mode and will not take the recommended action (Figure 4).

VULNERABLE POPULATIONS AND TARGETED COMMUNICATION

It is essential to consider that the best message for one community is not necessarily the most effective for another. Understanding the audience is just as important as understanding the information to be communicated, if not more so. The term "vulnerable populations" is not synonymous

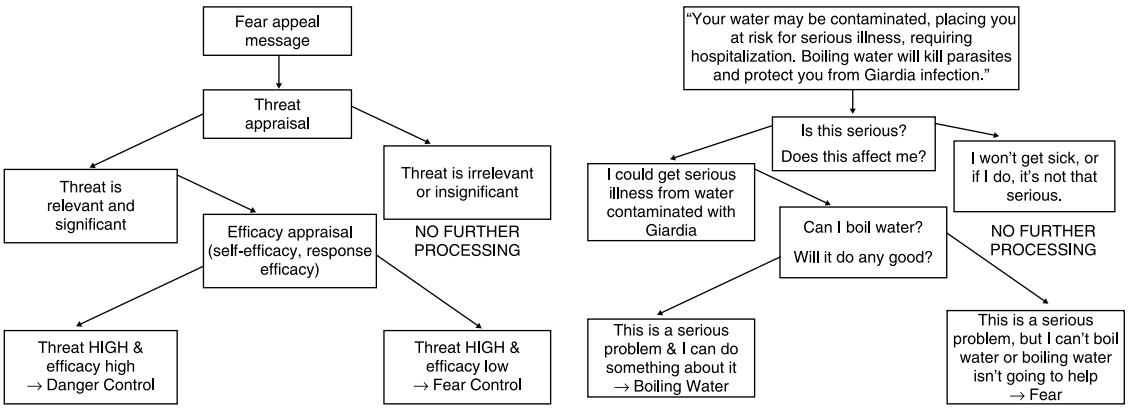

Figure 4 | Extended parallel process model.

with diverse populations. It goes far beyond issues of race/ethnicity alone.

For the purposes of this discussion, these vulnerable populations are vulnerable to neglect by the health care system or have difficulties in comprehension and/or accessibility that may limit full understanding of risks during a water contamination event. These difficulties result in knowledge disparities that may mitigate the effectiveness of public health strategies.

Vulnerable populations include, but are not limited to, the urban/rural poor, mentally ill, intellectually disabled, those who are at increased risk of waterborne illnesses, those at age extremes–children and the elderly, racial/ethnic minorities and the linguistically vulnerable (those of low literacy or limited English proficiency).

Each of these groups has characteristics that necessitate specially targeted messages. In its 2002 report, *Speaking of Health: Assessing Health Communication Strategies for Diverse Populations*, the Institute of Medicine states that "to maximize communication effectiveness, one should adapt message formats, sources, channels, and frequency of exposure for different audiences. Factors such as age, gender, race/ethnicity, and sexual orientation all draw on different interactions with the world and lead to different understandings regarding what is important and what is appropriate" (Institute of Medicine 2002).

When communicating with the public during crisis situations, such as water contamination events, it is vital to consider the multiple audiences who receive the messages. Different populations receive, process, understand and act on information differently. For example, Latino anglers and other minority populations interpreted health risks and fish advisories differently than anticipated (Beehler *et al.* 2003; Anderson *et al.* 2004). Targeted communication carefully considers the characteristics of the audience as well as barriers to effective communication, and it strives to overcome them by targeting messages to specific populations.

Potential barriers to effective health communication

There are a myriad of barriers to effective communication with vulnerable populations. As vulnerable populations are likely to experience disparities in health and health care, examining factors that contribute to disparities may elucidate barriers to effective communication in vulnerable populations. Although there are a variety of frameworks for considering health disparities, the discussion here will focus on individual health, health before information or care, health care access, and health care delivery (Health Policy Institute of Ohio 2004).

Health before information or care depends on a variety of factors. These factors include socioeconomic status, environmental conditions, lifestyle choices, educational level and employment. Access to health information or care is a complex interplay of numerous factors including: provider availability, proximity to patients, transportation, availability of medical home, language barriers, patient's cultural preferences, the diversity of the health care workforce, legal barriers, health literacy or trust of the medical system. Delivery of health information or care depends on

cultural competency of providers, patient–provider communication, provider bias, patient preference, patient adherence to treatment plan, appropriateness of care given and patients' insurance status.

STRATEGIES FOR EFFECTIVE COMMUNICATION WITH VULNERABLE POPULATIONS

Socio-economically effective messages

In 2005, thirty-seven million Americans were living below the Federal Poverty Level, with disproportionate numbers of racial/ethnic minorities being poor (US Census Bureau 2006). The interaction between socioeconomic status and health is a complex one (Haas 2006; Kiuila & Mieszkowski 2007). Those in poverty are often overlooked in the recommendation of routine health interventions and they face many barriers to recommended care (Jha *et al.* 2002; Haines *et al.* 2004). However, in order to provide information and care that is useful to the majority of the population, it is important to recommend low cost alternatives where they are available. It is also essential to consider options for homeless, those in shelters, migrants and refugees (Benson 2004; Kilanowski 2006; Podymow *et al.* 2006; Benson & Smith 2007; Kilanowski & Ryan-Wenger 2007; Schanzer *et al.* 2007).

Psychologically/intellectually appropriate messages

Though often overlooked, it is essential to remember that those who are mentally ill or intellectually disabled are also members of our communities and are also at risk in the event of water contamination events. These individuals receive and process messages differently than others in the community. Whether they are community-dwelling or institutionalized is important to consider as well. Different disorders may be associated with different communication problems (Spaniol *et al.* 1994; Brown 2002; Linhorst 2006; Rahman 2006). Additionally, speech, language or hearing may be impaired in individuals with mental illness or intellectual disabilities (Kramer *et al.* 2001). Families and care-givers need to be involved in transmission of information as do health care providers (Young *et al.* 2000; Finke 2004). Additionally, caregivers and health care providers need to be trained in effective communication with these populations as they experience significant disparities in health and health care (Trumble 1993; Kerins *et al.* 2004; Melville *et al.* 2005, 2006; Krahn *et al.* 2006).

Messages for those at high risk of waterborne illnesses

A number of medical conditions make patients more susceptible to waterborne illnesses. An immunosuppressed state can be caused by malignancy, HIV, steroid therapy and other immune diseases and immunosuppressive treatments. Chronic gastrointestinal (GI) diseases causing GI mucosa damage and breakdown of skin integrity puts patients at increased risk for waterborne GI infection. Additionally, as pure water is an essential component of dialysis systems, patients with end-stage renal disease are at increased risk for adverse events in the case of a contaminated water supply (Ward 2004; Ahmad 2005; Amato 2005; Ortolano *et al.* 2005). It is essential to communicate these various risks with health care providers as well as the general public (Cascardo 2006*a*, *b*; Kleinpeter *et al.* 2006).

Messages to children

Children and adolescents are not merely small adults, and in communicating with them, it is essential to consider their developmental stages. In times of crisis, it is essential to communicate to them that they are safe and avoid inducing unnecessary fear and anxiety (Maibach 1995; Wolraich *et al.* 1999; Hagan 2005; Markenson & Reynolds 2006). When preparing messages for children or adolescents, their parents and teachers need to be involved in both the development of the messages and their transmission. It is also essential that exposure to the media be monitored, as overexposure can be traumatizing. This is especially an important consideration for unsupervised latchkey kids (Maibach 1995; Wolraich *et al.* 1999; Hagan 2005; Markenson & Reynolds 2006).

Messages to older adults

As our populations age, it is increasingly important to make sure that information and care directed toward the general public are also accessible to older adults (Spotts & Schewe

1989; Schewe & Spotts 1990; Barrett 1994; Ryan *et al.* 1995; Ferguson 1997; Kopp 2001; Miller 2002; Wetzels *et al.* 2007). It is essential to consider vision and hearing changes as well as declining physical status (Bade 1991; Lichtenstein 1992; Lindblade & McDonald 1995; Witte & Kuzel 2000). Cognitive issues, such as Alzheimer's dementia or memory loss, should be a consideration as well. Regardless of the specific physical/cognitive impairment, it is essential to involve family or caretakers in the communication process (Polk 2005; Cotrell *et al.* 2006; Onor *et al.* 2006).

Culturally effective communication

Our global community is becoming increasingly multicultural. The US Census Bureau projects that, by 2048, 50% of the United States population will be composed of racial/ethnic minorities (US Census Bureau 1993; Smedley *et al.* 2003). These anticipated changes in demographics magnify the importance of addressing disparities in health status. Populations that currently experience poor health status are expected to grow as a proportion of the total nation's population. Our nation's future health is dependent on our nation's success in improving the health of racial/ethnic minorities (Satcher 2001; Smedley *et al.* 2003).

Understanding the impact of race/ethnicity and culture on health and health-related decisions is necessary to determine what messages are most effective in communicating risk and risk reduction strategies in a crisis situation. It is essential to know that the perception of illness and disease and their causes varies by culture. Few studies or process evaluations have focused on the perceptions of vulnerable populations on the messages delivered in risk and crisis communication. A recent study conducted among Hmong, Somali and Native American participants suggest that perceptions of risk and crisis are different among different cultural groups (Littlefield *et al.* 2006). Other studies suggests that not all segments of the population access and act on water-related public health advisory information in the same way (Beehler *et al.* 2003; Anderson *et al.* 2004).

Diverse belief systems exist related to health, healing and wellness. Culture influences help-seeking behaviors and attitudes toward health care providers. Individual preferences affect traditional and non-traditional approaches to health care. Patients must overcome personal experiences of biases within health care systems. Health care providers from culturally and linguistically diverse groups are under-represented in the current service delivery system (Smedley *et al.* 2003; Satcher & Pamies 2006). For these reasons, the most effective communication about health should consider these issues and target different populations (Institute of Medicine 2002).

It is essential that communication with vulnerable populations be culturally competent. While there are numerous definitions for this term, Cross *et al.* state that cultural competence is "appropriate and effective communication which requires the willingness to listen to and learn from members of diverse cultures, and the provision of services and information in appropriate languages, at appropriate comprehension and literacy levels, and in the context of an individual's cultural health beliefs and practices" (Cross *et al.* 1989).

Those developing messages for diverse populations during public health emergencies face unique challenges. Risk and crisis information and care must be accessible to individuals from all races and cultures. Title VI of The Civil Rights Act of 1964 states that "No person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance" (US Code 1964). To aid providers in implementing this, the Department of Health and Human Services has defined standards for culturally and linguistically appropriate services in health care (US Department of Health and Human Services 2001). Studies have undertaken to describe determine best practices for culturally competent care (Anderson *et al.* 2003; Wynia & Matiasek 2006; Bhui *et al.* 2007).

Linguistically appropriate communication

Linguistically appropriate communication addresses issues surrounding literacy as well as English proficiency. Messages must be appropriate for low literacy and limited English-proficient community members. This is especially important to consider in production of audio, print and multimedia messages. When translating and interpreting material from English to another language, it is essential to

ensure accuracy in not only the transmission of words but also in the transmission of cultural messages and analogies (Flores *et al.* 2003; Ngo-Metzger *et al.* 2003; Flores 2006).

Literacy

Health literacy is the degree to which individuals have the capacity to obtain, process and understand the health information and services they need to make appropriate decisions about their health (Nielsen-Bohlman *et al.* 2004). Estimates from the 1992 Adult Literacy Study suggest that 90 million American adults have literacy skills below the high school level and may lack the needed literacy skills to effectively use the US health system (American Medical Association 1999; Kutner & National Center for Education Statistics 2006). Individuals of low socioeconomic status and racial/ethnic minority populations are more likely to have limited health literacy skills (Nielsen-Bohlman *et al.* 2004; Kutner & National Center for Education Statistics 2006). It is essential that health literacy be considered in the development of public health messages in water contamination events (Doak *et al.* 1996; Covello *et al.* 2001; Rudd *et al.* 2003).

English proficiency

In our increasingly multicultural society, English is often not the primary language spoken in the home. While English is the official language of the over 60 million people residing in the United Kingdom, Eastern Panjabi (India), Sylheti (Bangladesh) and Yue Chinese are among the most commonly spoken languages aside from English (Gordon 2005). According to the 2005 American Community Survey, conducted by the US Census Bureau, 23 million individuals speak English less than "very well." Clearly, it is essential that important health information be made available in appropriate languages to reach the majority of the population (US Census Bureau 2005).

Studies have shown that a significant component of communication is listening, caring and empathy. Patients are aware of this in the care they receive. It is essential that, in the communication of water-related risk, empathy and compassion be effectively conveyed (Peabody 1968; Raz & Fadlon 2006; Staren 2006). No matter the audience, people are not interested in a communicator's knowledge of a particular subject matter if they do not sense the communicator's concern for them personally. Messages, especially in the face of a crisis, need to include this important element. It is essential to communicate clearly and with compassion (Covello 2003).

CONCLUSIONS

The contamination of a community's water supply by intentional or unintentional chemical, biological or terrorist agents poses significant risks to the health of all members of that community. Effective communication is audience-centered, and it is imperative that, in communicating public health messages to communities, we do not neglect our vulnerable populations. We must seek to understand them, develop messages that are appropriate for them and use messengers that are credible in their eyes. The diversity of our communities presents a unique opportunity to work with community leaders to develop, evaluate and refine risk messages, ensuring that they are appropriate for the targeted audience, before they are released to the community as a whole. We must carefully consider the perspectives and needs of vulnerable populations to ensure that the messages they receive in water contamination events are clear and effective. In situations such as those that occurred in Camelford, Bangladesh, Milwaukee and North Carolina, all segments of the community must receive clear, appropriate information that they can relate to. This is especially true in an age of heightened concern for the impact of terrorism on global water supplies. The global community's health depends on clear, timely and targeted risk and crisis communications before and during water contamination events.

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