Risk Communication, the West Nile Virus Epidemic, and Bioterrorism: Responding to the Communication Challenges Posed by the Intentional or Unintentional Release of a Pathogen in an Urban Setting

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ABSTRACT *The intentional or unintentional introduction of a pathogen in an urban setting presents severe communication challenges. Risk communication—a science-based approach for communicating effectively in high-concern situations—provides a set of principles and tools for meeting those challenges. A brief overview of the risk communication theoretical perspective and basic risk communication models is presented here, and the risk communication perspective is applied to the West Nile virus epidemic in New York City in 1999 and 2000 and to a possible bioterrorist event. The purpose is to provide practical information on how perceptions of the risks associated with a disease outbreak might be perceived and how communications would be best managed.*

KEYWORDS *Bioterrorism, Risk Communication, Risk Perception, West Nile Virus.*

The West Nile virus epidemic is a useful case study for examining the communication challenges posed by the appearance of a new infectious disease in an urban setting.[1] Effective communication is critical to the successful resolution of any type of health, safety, or environmental controversy.[2-4] High-concern situations involving risk create substantial barriers to effective communication[5,6] and evoke strong emotions, such as fear, anxiety, distrust, anger, outrage, helplessness, and frustration.[7,8] When the communication environment becomes emotionally charged, the rules for effective communication change. Familiar and traditional approaches often fall short or can make the situation worse.[2,3]

A body of communication theory, known as *risk communication*, offers insights into how crises and high-concern situations alter the usual rules of communication.[3,7] Risk communication science also provides a set of principles for meeting the challenges posed by the New York City West Nile virus epidemic.[2,3,9]

THE RISK COMMUNICATION PERSPECTIVE

The National Academy of Sciences defines *risk communication* as

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an interactive process of exchange of information and opinion among individuals, groups, and institutions. It involves multiple messages about the nature of risk and other messages, not strictly about risk, that express concerns, opinions, or reactions to risk messages or to legal and institutional arrangements for risk management.[5(p21)]

The scientific literature on risk communication addresses the problems raised in the exchange of information about the nature, magnitude, significance, control, and management of risks.[3,7] It also addresses the strengths and weaknesses of the various channels through which risk information is communicated: press releases, public meetings, hot lines, Web sites, small group discussions, information exchanges, public exhibits and availability sessions, public service announcements, and other print and electronic materials.[3,7,10]

Early risk communication research centered on debates about the health or environmental risks associated with waste disposal, toxic chemicals and heavy metals, air and water pollution, nuclear power, electric and magnetic fields, oil spills, food additives, radon in homes, and biotechnology.[2,11–17] Little attention was paid to risks caused by exposure to pathogens or to health belief models developed for addressing personal risk-taking behavior (e.g., smoking, alcohol consumption, and drug addiction).

Evaluation studies have consistently demonstrated the effectiveness of risk communication practices in helping stakeholders achieve three major communication objectives: providing the knowledge needed for informed decision making about risks; building or rebuilding trust among stakeholders; and engaging stakeholders in dialogue aimed at resolving disputes and reaching consensus.[3,5,18] The evaluation literature has also demonstrated the major barriers to successful risk communication,[2,6,12] including conflict and lack of coordination among stakeholders and inadequate risk communication planning, preparation, resources, skill, and practice.

Government officials, industry representatives, and scientists often state that nonexperts and laypeople irrationally respond to risk information and inaccurately perceive and evaluate risk information.[2,19] Representatives of citizen groups, worker groups, and individual citizens, in turn, often question the legitimacy of the risk assessment or risk management process. They have argued that government officials, industry representatives, and scientists are often uninterested in citizens' concerns or are unwilling to take actions to solve seemingly straightforward problems. These conflicts are often exacerbated by complex, confusing, inconsistent, or incomplete risk messages[2]; lack of trust in information sources[20]; selective and biased reporting by the media[2]; and psychological factors (heuristics) that affect how risk information is processed.[21–23]

Effective risk communication is a professional discipline; its application requires knowledge, planning, preparation, skill, and practice.[3] It is a two-way, interactive process that respects different values and treats the public as a full partner.[3,9] As part of this process, nonexperts acquire information about the risk in question and about the assessment and management of the risk. Experts and risk management authorities, in turn, acquire information about the interests and concerns of stakeholders.[24]

Despite this interactive perspective, evaluation studies indicate that personnel from many agencies and organizations involved in risk controversies lack the knowledge, sensitivity, and skills needed for effective risk communication.[6,12] They adhere to the "decide, announce, defend" (DAD) model and proceed with limited

understanding of the various stakeholders' values and concerns. They often fail to recognize and adapt to the fact that many people and groups use health, safety, and environmental risks as proxies or surrogates for other more general social, economic, political, or cultural concerns and agendas. They initiate risk communication efforts with inadequate resources, unclear objectives, and little or no empirically based information on

- who is perceived to be most trustworthy
- who is best suited to communicate risk messages
- which messages are most effective
- which messages are most respectful of different values and worldviews
- which messages raise moral or ethical issues
- which messages are most respectful of process
- where, when, and how the risk information should be communicated

RISK COMMUNICATION THEORETICAL MODELS

Risk communication is based on four theoretical models (risk perception, mental noise, negative dominance, trust determination) that describe how risk information is processed, how risk perceptions are formed, and how risk decisions are made.[5,7] Together, these models provide a foundation for thinking about and coordinating effective communication in high-concern situations.

The Risk Perception Model

Many factors affect how risks are perceived, and these factors can alter risk perceptions in varying degrees.[4,5,25–27] To date, at least 15 risk perception factors have been identified that have direct relevance to risk communication (see the Table).[3,4,8] These factors play a large role in determining levels of concern, worry, anger, anxiety, fear, hostility, and outrage, which in turn can significantly change attitudes and behavior.[4,8] For example, levels of concern tend to be most intense when the risk is perceived as involuntary, inequitable, not beneficial, not under one's personal control, associated with untrustworthy individuals or organizations, and associated with dreaded adverse, irreversible outcomes.

Because of the intense feelings that such perceptions can generate, the risk communication literature often refers to these characteristics as "outrage" factors.[8] Research indicates that an individual's perception of risk is based on a combination of hazard (e.g., mortality and morbidity statistics) and outrage.[8] When present, outrage factors take on strong moral and emotional overtones, predisposing an individual to react emotionally, which in turn can significantly amplify levels of perceived risk.

Risk perception research suggests that specific activities should ideally be undertaken as part of a risk communication effort.[28–30] First, it is important to collect and evaluate empirical information obtained through surveys, focus groups, or interviews about stakeholder judgments of each of the risk perception factors (particularly trust, benefits, control, fairness, and dread). Sustained interaction and exchange of information with stakeholders about identified areas of concern are also necessary. To plan and organize effective risk communication strategies, understanding of interested or affected parties regarding stakeholder perceptions and the expected levels of concern, worry, fear, hostility, stress, and outrage is necessary.

TABLE.   Risk perception factors

1. *Voluntariness*. Risks perceived as involuntary or imposed are less readily accepted and are perceived as greater than risks perceived to be voluntary.
2. *Controllability*. Risks perceived as under the control of others are less readily accepted and are perceived as greater than risks perceived to be under the control of the individual.
3. *Familiarity*. Risks perceived as unfamiliar are less readily accepted and are perceived as greater than risks perceived to be familiar.
4. *Equity*. Risks perceived as unevenly and inequitably distributed are less readily accepted than risks perceived as equitably shared.
5. *Benefits*. Risks perceived to have unclear or questionable benefits are less readily accepted and are perceived as greater than risks perceived to have clear benefits.
6. *Understanding*. Risks perceived as poorly understood are less readily accepted and are perceived as greater than risks from activities perceived as well understood or self-explanatory.
7. *Uncertainty*. Risks perceived as relatively unknown or that have highly uncertain dimensions are less readily accepted than risks that are relatively known to science.
8. *Dread*. Risks that evoke fear, terror, or anxiety are less readily accepted and are perceived as greater than risks that do not arouse such feelings or emotions.
9. *Trust in institutions*. Risks associated with institutions or organizations lacking in trust and credibility are less readily accepted and are perceived as greater that risks associated with trustworthy and credible institutions and organizations.
10. *Reversibility*. Risks perceived to have potentially irreversible adverse effects are less readily accepted and are perceived as greater than risks perceived to have reversible adverse effects.
11. *Personal stake*. Risks perceived as placing people personally and directly at risk are less readily accepted and are perceived as greater than risks that pose no direct or personal threat.
12. *Ethical/moral nature*. Risks perceived as ethically objectionable or morally wrong are less readily accepted and are perceived as greater than risks not perceived as ethically objectionable or morally wrong.
13. *Human versus natural origin*. Risks perceived as generated by human action are less readily accepted and are perceived as greater than risks perceived as caused by nature or "acts of God."
14. *Victim identity*. Risks that produce identifiable victims are less readily accepted and are perceived as greater than risks that produce statistical victims.
15. *Catastrophic potential*. Risks that produce fatalities, injuries, and illness grouped spatially and temporally are less readily accepted and are perceived as greater than risks that have random, scattered effects.

The Mental Noise Model

The mental noise model focuses on how people process information under stress and how changes in the way information is processed affect communication. When people are in a state of high concern because they perceive a significant threat, their ability to process information effectively and efficiently is severely impaired.[3,11,28] When people feel that what they value is being threatened, they experience a wide range of emotions, ranging from anxiety to anger. The emotional arousal and/or mental agitation generated by these strong feelings create mental noise. Exposure to risks associated with negative psychological attributes (e.g., risks perceived as involuntary, not under one's control, low in benefits, unfair, or dreaded) are also often accompanied by severe mental noise,[31–33] which in turn can interfere with a person's ability to engage in rational discourse.

The Negative Dominance Model

The negative dominance model describes the processing of negative and positive information in high-concern situations. In general, the relationship between negative and positive information is asymmetrical, with negative information receiving significantly greater weight. The negative dominance theory is consistent with a central theorem of modern psychology: People put greater value on losses (negative outcomes) than on gains (positive outcomes).[32] One practical implication of negative dominance theory is that a negative message should ideally be counterbalanced by a larger number of positive or solution-oriented messages.[5]

Another practical implication of negative dominance theory is that communications that contain negatives (e.g., the words *no, not, never, nothing, none*, and other words with negative connotations) tend to receive closer attention, are remembered longer, and have greater impact than positive messages.[5] As a result, the use of unnecessary negatives in dialogue with stakeholders in high-concern situations can be highly detrimental, having the unintended effect of drowning out positive or solution-oriented information or undermining trust by stating an absolute that is impossible to defend or maintain. More specifically, risk communications are most effective when they focus on what is being done rather than what is not being done.

The Trust Determination Model

A common thread in all risk communication strategies is the need to establish trust.[20,34,35] Only when trust has been established can other goals, such as education and consensus building, be achieved. Trust can only be built over time and is the result of ongoing actions, listening, and communication skill.[3,9,34] Because of the importance of trust in resolving risk controversies, a significant part of the risk communication literature focuses on the application of a trust determination model to particular scenarios. To establish or maintain trust, third-party endorsements from trustworthy sources should ideally be undertaken, as well as the use of four trust determination factor pairs: caring and empathy; dedication and commitment; competence and expertise; and honesty and openness.[35] Evaluation studies indicate that individual or small group settings, such as information exchanges and public workshops, are the most effective venue for communicating these trust factors.[5,28]

The principle of *trust transference* states that a lower trusted source typically takes on the trust and credibility of the highest trusted source with the same position on the issue.[5] Surveys indicate that certain organizations and individuals, including citizen advisory groups, health professionals, safety professionals, scientists, and educators, are perceived to have high-to-medium trust on health, safety, and environmental issues.[21] An advantage of being from a trusted group is that it enables a person to communicate effectively, even when communication barriers exist. However, individual trust overrides organizational trust. Trust in individuals from a highly trusted organization may significantly increase or decrease depending on how they present themselves (verbally and nonverbally) and how they interact with others.[3,12]

Perceptions of trust are decreased by actions or communications that indicate disagreements among experts; lack of coordination among risk management organizations; insensitivity by risk management authorities to the need for effective listening, dialogue, and public participation; an unwillingness to acknowledge risks; an unwillingness to disclose or share information in a timely manner; and irresponsibility or negligence in fulfilling risk management responsibilities.[2,12]

NEW YORK CITY'S WEST NILE VIRUS RESPONSE
RISK COMMUNICATION IN PRACTICE

The first outbreak of West Nile virus in New York City occurred in late summer 1999. By the following summer, the New York City Department of Health had developed a detailed response plan that included public education and outreach.[36] The three objectives for public education and outreach plan were (1) to improve the public's awareness of risk for disease, (2) to improve the public's participation in eliminating potential breeding sites, and (3) to provide timely and accurate information related to insecticide spraying. Channels of communication included television and radio public service announcements; press releases, extensive media outreach, and announcements during the scheduled daily mayoral press conferences; brochures and fact sheets, prepared in 10 to 15 languages; posters placed throughout the city; bill inserts mailed with the cooperation of city utilities, including the Consolidated Edison Company of New York and the Water Department; phone lines staffed and answered 24 hours a day and 7 days a week at the height of the outbreak, including the handling of over 150,000 calls; a Web site that included general information, a question-and-answer section, forms for reporting standing water and dead birds, insecticide fact sheets, and press releases issued during the outbreak; and a limited number of town hall public meetings.

The primary spokespersons were the New York City Health commissioner and the mayor. In the outer boroughs, the borough president often assumed the mayor's role. The majority of the press releases addressed spraying and included telephone numbers to call for more information. Print materials, generally written at a high school reading level, contained information about personal protective behavior (e.g., sheltering in place and protection against mosquitoes) and included a request that the public assist government agencies by eliminating sources of standing water in which mosquitoes might breed.

In general, the New York City risk communication effort related to the West Nile virus epidemic was far-reaching, resource intensive, competently handled, and effective. At the same time, several areas for improvement can be noted.

New York City officials were clearly aware of risk perception factors and took these factors into account in their decisions. However, analysis of case study material indicates that little effort was made to collect, analyze, and evaluate empirical information—such as that obtained through surveys and focus groups—about stakeholder judgments of each of the major risk perception factors. Furthermore, the full range of communication channels, such as information exchanges and information workshops for engaging stakeholders in sustained interaction about identified areas of concern, were not exploited. Official spokespersons were apparently not informed about stakeholder perceptions or about expected levels of concern, fear, hostility, or outrage of various stakeholder groups.

In addition, public concern over the city's decision to use pesticides (e.g., malathion in 1999) for vector control, as well as the controversial decision to engage in aerial spraying by highly visible helicopters, underscores what appears to be an initial failure by city officials to ascertain the risk perceptions of an expanded circle of stakeholders, including wildlife experts and environmental groups.

The communication materials produced by city officials were highly informative. However, from a mental noise perspective, they also contained many more messages than could be easily comprehended by the intended audience. In addition,

these materials contained inadequate repetition and visualization. For example, explanatory charts and graphs were generally absent, as were videotapes about the effects of West Nile virus. Finally, most of the risk communication materials produced by the city were several school grade levels higher than recommended.

Analysis of West Nile virus case study material indicates an apparent lack of attention to the unequal weights given to negative and positive information in high-concern situations. For example, many of the communications focused more on what was not being done by city authorities or on what would not be done than on what was being done and what would be done. In addition, negative messages (e.g., the decision to spray pesticides from helicopters and the decision to cancel a concert at Central Park) were not simultaneously counterbalanced by a larger number of positive or solution-oriented messages. The case study materials also provide little evidence that the positive or solution-oriented messages that were offered were the product of sustained interaction and dialogue with a wide range of stakeholders.

In general, city officials effectively communicated the four trust determination factors. Importantly, New York City officials and their families remained in the city during the outbreak. Given the controversial nature of pesticide spraying, early coordination and work with recognized wildlife and environmental groups and experts could have established credible third parties. It is not clear whether third-party endorsements (e.g., from faculty at major New York universities or medical schools) were solicited as part of the communication effort.

Additional factors compounded trust problems. The telephone hot lines, while answered 24 hours a day, in some cases were staffed by personnel in remote locations who were inadequately trained in risk communication. Communication directed to sensitive populations—such as asthmatics—about spraying locations and schedules was neglected. In addition, town hall meetings were overutilized, while more effective small group activities, such as information exchanges and public workshops, were underutilized. Disagreements and lack of coordination among risk management organizations, such as the lack of attention given by public health authorities at the city, state, and federal levels to early warning messages by wildlife experts at the Bronx Zoo, facilitated mistrust.

A BIOTERRORIST EVENT: A PROSPECTIVE EXAMPLE OF RISK COMMUNICATION PRACTICE

Many urban areas are preparing for an unprecedented crisis—a bioterrorist event.[37,38] A bioterrorist event in an urban area of North America presents an extraordinary requirement for risk communication planning, preparation, and practice.

Several factors could compound a bioterrorism event: the element of surprise, the use of an unseen lethal biological agent, the presence of an unknown perpetrator, the likelihood of widespread simultaneous attacks, and the probable delayed detection and reaction by public health agencies. Given the expected level of high concern and the possibility of fear leading to panic, the application of sound risk communication principles will be imperative.

A bioterrorist event would likely trigger the full set of the risk perception factors. These factors would amplify the perceived magnitude of risk to levels unprecedented in the history of crisis communication. The perception factors that would most likely be amplified include involuntariness, uncontrollability, unfamiliarity,

unfairness, lack of understanding, uncertainty, dread, ethical/moral violations, and distrust in institutions. All would combine to intensify the perceived risk.

A number of actions could be taken to modify the public's risk perceptions in response to a possible bioterrorist event. The trust the public has in the emergency responders is critical to the effectiveness of any postevent response. Such trust should be established well in advance of the event. Case studies, such as the chemical industry's Responsible Care program, indicate that proactive community outreach is one of the most effective means for achieving this goal.[39]

A domestic bioterrorist event is so horrible to contemplate that many people would likely adopt a mindset of denial, which could exacerbate the emotional and behavioral consequences of an actual bioterrorist event. By introducing the potential for a bioterrorist attack in a measured, progressive, and interactive manner—such as through school programs and student take-home assignments—familiarity can be established in advance of an event.

Although the attackers will control the specific circumstances by which a bioterrorism attack creates terror, a legitimate sense of control can be given to those under threat, especially in advance of an attack, by public education, by public participation in the preparation process, and by providing the public a voice in the decisions that will affect them. A citizen advisory panel, comprised of community members respected by and credible to their peers, can be an effective mechanism for gaining constructive public participation and dialogue about possible high-concern situations.[40]

The intensity of emotions evoked by a bioterrorist event would predictably result in extreme levels of mental noise. In an unprepared context, communication could be virtually shut down. To avert this potential, all relevant emergency response organizations must be committed to producing communications, from the preparatory stage to final resolution, that are clear and concise and based on sound risk communication principles. Extensive communication training and practice opportunities, including scenario development, must be provided in advance of the crisis event.

In line with negative dominance theory, bioterrorism risk should include communications free of unnecessary negatives, offer a larger number of positive or solution-oriented messages, and focus on what is being done rather than on what is not being done in response to the potential event. Extensive risk communication training and practice opportunities must be provided in advance of the crisis event.

Unless conveyed by trusted sources, the most competently prepared communication materials will fall short in a high-concern situation. Those responsible for public communication in the event of a bioterrorist attack need to consider the trustworthiness of institutions, as indicated by surveys and focus groups; the trustworthiness of individual spokespersons; and the inclusion of trusted third-party voices in support of key messages.

CONCLUSION

Emerging illness and bioterrorism present extraordinary communication challenges. However, it is possible to develop an effective risk communication strategy for such events. It would be a serious error to underestimate the importance of developing, by consensus among organizations, a risk communication strategy and plan. The planning, preparation, and practice must begin now.

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