Communicating With the Public About Emerging

Health Threats: Lessons From the Pre-Event Message Development Project

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Effective public communication is a crucial component of emergency response.1,2 Timely, accurate information can help people at risk take appropriate protective measures, prevent illness and injury, reduce unnecessary care seeking, and facilitate relief and recovery efforts.3,4

Although all public health emergencies present significant challenges for communicating with the public, emerging, unfamiliar, unidentified, or intentionally released agents, such as radioactive ‘‘dirty bombs,’’ chemical terrorism, and avian influenza, can pose even greater communication difficulties for public health professionals. Research and historical experience have shown that such threats have a powerful potential to generate fear, cause negative behavioral responses such as social stigma,5 and undermine confidence in social institutions. Such reactions complicate efforts to manage an emergency and make the already daunting task of rapidly conveying complex self-protection information even more difficult.6–8 Furthermore, agencies can face unprecedented demands for information even as resources are stretched thin as they attempt to respond to the situation.9

Aware of the communication challenges posed by the 2001 anthrax letter incidents, the Centers for Disease Control and Prevention (CDC) established a cooperative agreement with the Association of Schools of Public Health in 2002 to support a major study of emerging information needs and information-seeking strategies of members of the public facing emerging threats. Between 2002 and 2006, we conducted the Pre-Event Message Development Project (PEMDP), whichassessed communication needs of the public in the event of emerging threats.

The PEMDP study teams examined communication needs related to 4 agents— radioactive materials, plague (infectious agent), Objectives. We sought to better understand the challenges of communicating with the public about emerging health threats, particularly threats involving toxic chemicals, biological agents, and radioactive materials.

Methods. At the request of the Centers for Disease Control and Prevention, we formedaninterdisciplinaryconsortiumofinvestigativeteamsfrom4schoolsofpublichealth.Over2years,theinvestigativeteamsconducted79focusgroupinterviews with 884 participants and individual cognitive response interviews with 129 respondents, for a total sample of 1013 individuals. The investigative teams systematically compared their results with other published research in public health, risk communication, and emergency preparedness.

Results. We found limited public understanding of emerging biological, chemical, and radioactive materials threats and of the differences between them; demandforconcrete,accurate,andconsistentinformationaboutactionsneededfor protection of self and family; active information seeking from media, local authorities, and selected national sources; and areas in which current emergency messaging can be improved.

Conclusions. The public will respond to a threat situation by seeking protective information and taking self-protective action, underlining the critical role of effective communication in public health emergencies. (Am J Public Health. 2008;

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| botulinum toxin (noninfectious agent), and VX (nerve agent)—in 3 threat categories—radioactive agents, biological agents, and chemical agents (Table 1). Each agent was studied independently and as a representative of the broader category to generate agent-specific communication recommendations and general insights into emerging threats.We present the overarching findings of the PEMDP here for the first time; agent-specific results are published elsewhere.10–15 By examining the results across a range of threats and systematically comparing the findings with comparable research, we hope to provide valuable general lessons for risk communication in public health emergencies. (All project reports, publications, and message materials are publicly available at http://www.bt.cdc. gov/firsthours/intro.asp.16)Our aims for the PEMDP were to (1) investigate the general public’s current knowledge, concerns, and potential responses to threats | and to pretest existing agent-specific informational materials developed by the CDC (year 1); (2) develop and pretest new message materials on the basis of the first year’s findings (year 2); and (3) assess study findings in comparison with relevant published research (year 3). Partner schools (Saint Louis University, the University of California at Los Angeles, the University of Oklahoma, and the University of Alabama at Birmingham) established a common protocol for all research. We standardized recruitment protocols, instruments, coding guides, and reporting templates across institutions. Each university’s institutional review board approved original research.METHODSFormative ResearchAll study teams conducted formative research regarding all 4 agents. On the basis of respective areas of expertise, each study team |

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| Agent Categories | Operational Definitions | Examples | Risks |
| Biological agents | Viruses, bacteria, or other germs used to cause illness or death among people, animals, or plants. Biological agents can be spread through the air, through water, or in food. Some agents, like the smallpox virus, can be spread from person to person, and some, like anthrax, cannot. | Anthrax, botulism, plague, smallpox, tularemia, avian influenza | Biological agents have the potential to cause excess morbidity and mortality and a major public health impact. They vary in terms of the severity of illness or likelihood of death because of exposure. |
| Chemical agents | Toxic chemical substances that may be accidentally or intentionally released. Exposed individuals either have direct physical contact with or breathe in the substance.Effects are not infectious. | Mustard gas, cyanide, chlorine, sarin gas, VX | Chemical agents are categorized according to their effects on the human body. Blistering agents cause pain, swelling, and itchiness on the skin and in the nose, mouth, and throat. Blood agents deprive the blood and organs of oxygen. Nerve agents damage the nervous system and affect movement and breathing. Choking agents attack the respiratory system and cause difficulty breathing. |
| Radioactive agents | Release of radioactive materials, potentially exposing people to radiation or resulting in radioactive contamination of structures, areas, objects, or people. | Could be released using a ‘‘dirty bomb,’’ which combines conventional explosives and radioactive materials | The most serious injuries from a dirty bomb, including burns or bleeding, are likely to be from the conventional blast itself. However, depending on the incident, substantial numbers of people could become externally or internally contaminated with radioactive materials. |

# TABLE 1—Agent Categories, Definitions, Examples, and Risks: Pre-Event Message Development Project, 2002–2006

Source. Adapted from http://www.bt.cdc.gov/firsthours/intro.asp.16

concentrated on 1 agent in data analysis, reporting, and message development. In years 1 and 2, study teams conducted formative research with members of the public segmented by ethnicity and by urban or rural residence. Formative research from year 1 informed agent-specific audience assessments that guided the writing, design, and pretesting of radio, television, and print materials in year 2.

The PEMDP conducted focus groups and interviews with members of 9 public audience segments: rural and urban Whites, African Americans, and Hispanics; rural American Indians; urban Asians; and urban intermediate and advanced English as a second language students. Purposive sampling ensured adequate representation of all groups. Recruitment sought to ensure broad representation in terms of age, socioeconomic status, education level, and gender across the study sample. Collaborating community service agencies or professional recruiters recruited study participants from their service areas, or study team members recruited from databases of past study participants. Only adults were permitted to participate in the study. Individuals with a history of trauma or psychiatric illness or whose relatives or friends were killed or injured in a terrorist incident were excluded. Participants were compensated for their time.

Trained interviewers conducted focus groups and interviews in community settings and university facilities. We conducted focus groups and interviews in the 4 regions in which the schools are located. Focus groups and interviews were conducted in English with the exception of Hispanic focus groups in year 1, which were conducted in Spanish.

Focus group guides asked participants about current knowledge of different threat categories. A 4-stage hypothetical agent-specific scenario followed in which the release of an unidentified agent is threatened, release of the agent occurs, the agent is identified, and informational materials are provided (Table 2). At each stage, participants were asked about their emotional and behavioral response, concerns, information needs, and informationseeking strategies during the event. Participants were also asked about their confidence in the official response to the emergency. Focus group and cognitive response interview guides assessed responses to the draft message materials and media, including comprehension, missing information, emotional responses, perceived credibility, response efficacy, self-efficacy, and recommendations for improvement (Table 3).

Audiotapes of focus groups and interviews were transcribed and entered into qualitative data analysis programs for coding and analysis. Coding guides derived from question topics allowed unanticipated themes to emerge. Trained pairs of analysts coded and recoded transcripts until domains were ‘‘saturated’’ and common themes emerged, providing an auditable trail of findings.17–19 Pairs of researchers checkcoded each transcript, reviewing their work to discover and resolve disagreements. Statements associated with relevant codes were extracted from each transcript and analyzed for meanings. These meanings were clustered into themes that could be analyzed and reported on across focus groups and interviews.20 Analysts used matrices summarizing results by theme and group to identify similarities and differences across audience segments, regions, and place of residence and prepared agent-specific reports.19

## Participant Characteristics

In year 1, the study teams conducted 37 focus groups with 444 participants. In year 2, the study teams conducted 42 focus groups

# TABLE 2—Sample Scenario of a Hypothetical Plague Release in St. Louis, Missouri

 Scenario Sequence Discussion Guide Verbatim Language

Part 1: Nonspecific agent You wake up about 7 am on a Tuesday and turn on the local news to hear that President Bush has raised the Homeland Security Advisory System threat level to

severe (red). The president and his advisors report that this change in the national threat level is based on knowledge of a credible threat that a terrorist group may be planning a biological attack in St. Louis. Officials suspect that the attack may involve a biological weapon.

Part 2: Symptoms A week later, early on a Monday afternoon, you turn on the radio and hear that 15 people in St. Louis have presented at local emergency rooms and doctors’ offices

with fever, headache, weakness, and rapidly developing pneumonia with shortness of breath, chest pain, cough, and bloody saliva. Although the cause has not been confirmed, these symptoms are consistent with plague. Plague is a disease that can infect the lungs and may spread from person to person through the air. Part 3: Specific agent + Later that same day, you turn on your TV to find that a local government official has issued a statement. She confirms that there has been a deliberate release of a symptoms + response biological agent in St. Louis and that the agent has been confirmed to be the one that causes plague. It was believed to have been released at a shopping mall

into the air. So far, there are 30 presumed cases; however, more persons in St. Louis are potentially infected. Local health workers and emergency personnel are working to contain the problem by shutting down the mall, figuring out who was there, and calling for the potentially infected to seek medical treatment.

Part 4: Release of Local officials release information with recommendations for steps you can take to protect yourself from plague.

information

# TABLE 3—Research Topics and Sample Questions: Pre-Event Message Development Project, 2002–2006

ResearchTopic

SampleQuestions

Formative research topics and questions

 Preevent knowledge, attitudes, and responses What is a biological threat?

General knowledge about basic health science as it How can it be transmitted? relates to different threats

 Emotional response to an attack Tell me how you would feel about this news?

 Actions in response to an attack What would you do?

 Terrorism information needs What would you want to know?

 Terrorism information-seeking behavior Where would you go to get more information?

Confidence in the government and public health How confident are you that there are systems in place that will response to a potential attack respond in a way that keeps you safe?

Materials pretesting topics and questions

 Comprehension What do you think are the main points of these fact sheets?

 Emotional response How do these fact sheets make you feel?

 Believability How credible is the information in the fact sheets?

Self-efficacy How confident are you that you can carry out these recommendations? Response efficacy How confident are you that the actions recommended in the fact

sheets will keep you safe?

 Recommendations for improvement Do you have any other recommendations to make these fact

sheets better or more useful to you?

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| with 440 participants and 129 cognitive response interviews; the total sample size was 1013 (Table 4). For the total sample, the mean age was 44 years. Two thirds of the sample (65%) were women. About one eighth of the sample (13%) had less than a high school diploma; almost half had completed high school (18%) or some college (27%); more than one third had a college degree (23%) or | higher (13%); 6% opted not to provide information on education level.The race/ethnicity of the sample was consistent with the purposive sampling: 23% were African American, 10% were American Indian or Alaska Native, 18% were Asian or Pacific Islander, 22% were White, and 24% were Hispanic. Seventy-five percent of the sample (73%) spoke English at home, 13% |

spoke Spanish, and 12% were bilingual or spoke another language at home. Almost half of the participants were married or living with a partner (43%), one quarter (25%) were divorced, separated, or widowed, and about one fourth was single (26%). More than half the sample had children (62%) and were employed (59%). Less than half the sample earned a family income less than $30000 (46%).

## Verification Analysis

In year 3, verification analysis was conducted to assess how the PEMDP results compared with research on similar topics, to understand why any contradictions appeared, and to specify instances where the PEMDP identified new results. Researchers searched multiple databases using search terms to obtain articles or reports on research that corresponded with the PEMDP. Peer review articles as well as available organizational research and public polling reports were included. We selected 729 articles in the first round of inclusion to represent available research published through June 2005. For the second round of inclusion, research teams used standardized criteria to select from the first round results. We selected 131 articles on risk communication and public (not professional) perceptions about disasters, disease outbreaks, and terrorism for the verification analysis.

Each article was coded according to specific categories in a standardized database: study method (qualitative or quantitative), type of data collection, threat, topic area, subject

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| --- | --- | --- | --- | --- |
| Characteristics | Year-1FocusGroups | Year-2FocusGroups | Year-2 CognitiveResponseInterviews | Year 1 andYear 2Combined |
| No. of participants | 444 | 440 | 129 | 1013 |
| Mean age, y | 44.24 | 44.72 | 39.78 | 43.88 |
| Gender, %Men | 39 | 29 | 33 | 34 |
| Women | 61 | 68 | 67 | 65 |
| Data missing | < 1 | 3 | 0 | 1 |
| Education, %Less than high school | 9 | 3 | 4 | 6 |
| Some high school | 9 | 6 | 6 | 7 |
| High school diploma or GED | 18 | 19 | 13 | 18 |
| Some college | 25 | 27 | 32 | 27 |
| College degree | 17 | 28 | 30 | 23 |
| Graduate degree | 11 | 15 | 15 | 13 |
| Data missing | 11 | 2 | 0 | 6 |
| Race/Ethnicity, % African American | 21 | 24 | 28 | 23 |
| American Indian/Alaska Native | 10 | 10 | 12 | 10 |
| Asian/Pacific Islander | 14 | 22 | 14 | 18 |
| White | 21 | 24 | 22 | 22 |
| Hispanic | 30 | 17 | 23 | 24 |
| Other | 3 | 0 | 0 | 1 |
| Data missing | 1 | 3 | 0 | 2 |
| Language in home, %English | 64 | 79 | 83 | 73 |
| Spanish | 20 | 7 | 10 | 13 |
| Bilingual/English and other | 8 | 0 | 8 | 3 |
| Other | 7 | 11 | 0 | 9 |
| Data missing | 1 | 2 | 0 | 2 |
| Marital status, %Single | 28 | 31 | 45 | 26 |
| Married or living with partner | 43 | 42 | 33 | 43 |
| Divorced or separated | 12 | 17 | 13 | 17 |
| Widowed | 8 | 7 | 7 | 8 |
| Data missing | 10 | 4 | 1 | 6 |
| Children, %Yes | 66 | 58 | 63 | 62 |
| No | 30 | 38 | 36 | 34 |
| Data missing | 5 | 4 | 1 | 4 |
| Employment, %Yes | 53 | 61 | 70 | 59 |
| No | 39 | 36 | 28 | 36 |
| Data missing | 8 | 3 | 2 | 5 |
| Family income, %£ $10,000 | 17 | 14 | 14 | 13 |
| $10000–$19,999 | 19 | 16 | 20 | 17 |

# TABLE 4—Demographic Characteristics of Study Participants: Pre-Event Message Development Project, 2002–2006

Continued

terms, and findings. Study teams reviewed all articles on threats comparable to their priority agent. Analysts looked for similarities and differences between existing research and the findings of the PEMDP. We synthesized the results of verification analyses across the 4 PEMDP agents for presentation here.

# RESULTS

We anticipated that participant responses would vary according to different kinds of agents or agent categories, but overall, the findings were consistent across agents and populations and with previous research on emergency risk communication, except where noted. The project also produced important new findings that expand our understanding of emerging public health threats and the challenges they pose for effective communication. Table 5 presents key findings of the study and implications for communication.

## Pre-Event Knowledge

PEMDP findings indicated that members of the general public have a limited understanding of biological, chemical, and radioactive materials hazards, consistent with past quantitative research, including representative national surveys, about infectious disease outbreaks, disasters, and terrorism.21–27 The PEMDP analysis identified several novel results: focus group participants often struggled to understand differences between categories of agents, for example, between infectious and noninfectious agents or between radiological and nonradiological agents. Urban groups appeared more knowledgeable than did rural groups. Rural groups tended to be less concerned about the threat of terrorism, thinking that urban areas were more likely to be targeted.

## Information Needs in an Event

Faced with an emergency, members of the public need detailed information about the nature of the threat, how to protect themselves and their families, and the official response to the situation. Across the 4 agents studied, the demand for information about protective actions was consistent: participants wanted to know how to avoid exposure, recognize symptoms, and treat effects. PEMDP findings were generally consistent with past

survey and qualitative research on information needs in an event,9,23,28–35 including national polling data.29 The PEMDP looked for differences across regions, whereas previous surveys presented results aggregated at the national level or specific to 1 region (e.g., New York City). The PEMDP found that information needs were consistent across all regions and population subgroups studied.

The open-ended questions in the PEMDP allowed unanticipated responses to emerge. Two important themes were identified: concerns about what to do if an individual is driving in a car when an emergency occurs and what to do to protect pets from exposure to toxic agents. Few government materials on emerging threats included such information at the time data were collected, but new materials have begun to incorporate these elements as a result of the PEMDP research.

The PEMDP focus groups also indicated that people want as much protective information as possible. This contradicts the results of one survey in which respondents complained about too much information.33 However, that survey inquired about information needs before an event, whereas the PEMDP asked about information needs during an event.

## Information Seeking in an Event

The PEMDP found that the public will turn to the broadcast media, especially television, for emergency information first, confirming survey and qualitative research.34,36–45 Print news and the Internet are also viewed as important sources of information, and the radio was seen as valuable in scenarios in which electric power is out or when people are driving. In addition to media sources, PEMDP findings suggest that the public will also seek information from respected local sources and networks, including emergency and law enforcement personnel and medical and public health professionals, who are seen as having relevant expertise. This is also consistent with previous research.9,28,46–52 PEMDP findings also confirmed results of a study that found that people would check a number of sources to validate information.45

We also discerned important new findings regarding information seeking in an emergency. Most notably, we found that rural populations turn to local authorities first, whereas urban residents turn to broadcast media first. Caused in part to the relative scarcity of local broadcast media in rural areas, rural individuals rely more on the telephone for information. Rural participants reported more familiarity with and trust in local officials as information sources. Members of the public living near an attack will turn to local media first and then national media. Again, radio is an important backup when power is out or individuals are driving.

Our results contradicted those of 2 studies. The first study found that cable television channels were preferred,42 whereas the PEMDP found that local television channels tend to be favored. The PEMDP focus groups referred to a hypothetical local event, however, whereas the survey asked about a national event. In the second study, a nonrepresentative sample indicated that the Internet was a favored source.28 PEMDP participants reported that the Internet was less preferred during a crisis and more likely to be used later.

## Public Actions in an Event

TABLE4—

Continued

14

$20000–$29999

12

18

16

12

$30000–$39999

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10

12

9

10

$40000–$49999

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$50000–$59999

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$60000–$69999

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4

$70000–$79999

1

5

3

$80000–$89999

1

1

2

2

$90000–$99999

2

2

2

2

‡

$100000

5

4

5

2

15

Datamissing

6

21

11

The PEMDP found that priority actions of the public were to seek information about the emergency and to protect self and family, confirming research following actual emergencies29 and quantitative and qualitative research.25,29 Our results were also consistent with a number of surveys reporting that significant numbers of people—in some cases up to 90%—indicate they may not

comply with official directives to shelter-inplace or evacuate.41,53–55 The status of family members, especially children in school, and knowledge of preparedness plans for family members in other locations are determining factors for adherence to shelterin-place directives.41,53,54,56–58

## Emotional Response in an Event

PEMDP findings showed that situations involving emerging health threats can produce strong emotional responses, including worry, fear, shock, anger, and disbelief, which is consistent with past survey and qualitative research.39,59,60 Groups at specific risk, such as those living near hazardous facilities or disabled or older adults, had heightened concerns about safety and their ability to take protective action. The focus groups also demonstrated that minority groups, especially American Indians and Hispanics, tend to be more fatalistic and have less faith in the efficacy of protective actions and are more likely to lose hope, which is consistent with past research. 39,59,60

## Confidence in Government

PEMDP findings showed that the public questions the capacity and readiness of the local, state, and federal governments to handle terrorist disasters, which is consistent with past survey and qualitative research.31,41,54,61–65 The PEMDP also corroborated published findings that suggest that distrust of the government is more pronounced among minority communities, including African Americans and Hispanics, who fear unequal treatment in a disaster.50,66,67 The PEMDP results were consistent with a quantitative study showing that openness in government response about an event is important in fostering

trust.26

TABLE 5—Confirmatory and Unique Study Findings and Implications for Emergency Communication:

## Pre-Event Message Development Project, 2002–2006

 Topic Confirmatory Findings Unique Findings Implications for Emergencies

 Pre-event knowledge The public has limited knowledge of radioactive, There is limited understanding of the differences

 chemical, and biological agents. between threats. Urban residents are more

knowledgeable; rural residents perceive lower threats in their areas.

Information needs in an The public needs detailed information about the Information needs were consistent across region event threat, official response, and steps to take and agent. The public wants to know what to

to protect self and family, specifically, how do if driving in a car and what to do to to avoid exposure, recognize symptoms, protect pets. and treat effects.

Information seeking in an The public will turn to broadcast media for Rural populations look to local authorities first for event emergency information, as well as local emergency information; urban residents seek

information sources, including emergency, information from broadcast media first. Rural law enforcement, and health professionals. residents report greater trust in local officials. Individuals use multiple sources to validate Individuals near an emergency turn to local information. sources first, then national.

 Public actions in an event Priority actions are to seek information about the None.

emergency and to protect self and family. Adherence to directives such as shelter-inplace will vary.

 Emotional response in an Emerging health threats provoke strong emotions, Individuals at greater risk (e.g., disabled) may

 event including fear, shock, and anger. Members have heightened concerns about their ability

of minorities may be less confident in to respond. Increased information decreases protective actions. fear and anxiety.

 Confidence in government The public questions the readiness of local, state, Members of the public have more confidence in

and federal government agencies to handle local than federal authorities and are more emergencies. Distrust is greater among likely to trust first responders than politicians.

members of minority communities.

The content of emergency None. The public responds positively to practical, message materials concrete action steps, clear and accurate

information, and consistent and simple messages. Unfamiliar terms cause confusion and uncertainty.

 Response to media The public generally perceives the news media as In general, complete and accurate information

useful providers of emergency information, about protective actions reduces fear and despite concerns about sensationalism. anxiety.

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| The Content of Emergency MessageMaterialsA unique contribution of the PEMDP project was the assessment of draft television, radio, and print materials about the threats. Many general findings from this exercise were consistent with best practices for general risk communication.68 Participants responded positively to practical, concrete action steps, clear and accurate information, and messages that were consistent and simple. Television | messages were more likely to get the attention of participants, but print materials were considered more complete.At the same time, the interviews identified important sources of confusion and uncertainty (i.e., the term ‘‘shelter-in-place’’) in current government messaging efforts.11 Non-English speakers consistently had problems understanding communications and feared that they would miss vital instructions. |

Assume the public does not know basic information about the threat. Provide basic information about transmission, exposure, symptoms, treatment.

The public will look for detailed information on the nature of the threat, action steps to stay safe, and government response. Action steps and attentiveness depend on proximity to event.

Both broadcast media and local officials need to be prepared with accurate information in an emergency. Consistency across sources establishes accuracy and veracity of information.

Quickly provide information regarding specific protective actions and explain why actions are protective.

Anticipate emotional response. Include action steps in public communication to reassure the public, especially those close to the threat.

Officials can foster trust by being open about official response, available information, and protective actions.

Emergency-response communication should include accurate information about steps people can use to keep themselves and their families safe. Messages should be clear and simple, and unfamiliar terms need to be explained.

News coverage and information about emergencies have emotional effects. Actionable messages are reassuring.

### Response to Media

The PEMDP found that media coverage of emergencies is generally perceived as a source of useful information, confirming past research regarding public perceptions about broadcast media in an emergency.34,36–39 However, many members of the public are skeptical about the motives of the media because they perceive the media to have a tendency to sensationalize reports. The PEMDP confirmed experimental research showing

that some news coverage of emergencies can increase levels of fear.69 In the PEMDP pretests, television and radio spots caused some fear and anxiety, which was attributed to doubts about completeness of messages, credibility of sources, and uncertainty. Overall, however, we found that complete and accurate information conveying protective actions reduced levels of fear and anxiety.

Non-English speakers expressed concerns that information would not be available in their native language. Hispanic participants indicated that they would listen to both Spanish and English media to cross-validate information.

# DISCUSSION

The public’s understanding of biological, chemical, and radiological threats and the differences between categories appears to be limited. In an emergency, segments of population across ethnicity and region demanded information about protective actions. Members of the public say the immediate actions they will take in an emergency are active information seeking from media and local authorities and protection of self and family. Openness in government response about an event, concrete and accurate information, and consistency across sources foster confidence and trust. Key terms often found in emergency messages are often misunderstood. Likewise, members of the public question the feasibility of some emergency instructions.

The design of the PEMDP enabled study teams to identify differences between audience segments. Results were consistent across agent categories and segments overall, with a few exceptions. Rural populations were more likely to seek information from local authorities first, whereas urban residents would rely more on the mass media. Multiple communication issues pertain to minority groups, the most important of which are greater levels of distrust and higher levels of fatalism.

By combining a synthesis of research across threat categories and a systematic literature review, concerns about generalizability and adherence can be addressed. First, the PEMDP’s findings of a common set of public responses and information needs in biological, chemical, and radiological events suggest that it is possible to generalize to a range of emerging threats. Second, our research has given us an in-depth understanding of public response to such threats. Our data, supported by the verification analysis findings, suggest that the public will respond to a threat situation by seeking protective information and taking self-protective actions, although these actions may not always be consistent with the public good or public health directives. This further underlines the critical role of effective communication in public health emergencies.

## Limitations

Limitations inherent in focus group and interview research are introduction of bias and constrained generalizability of results. Study participants made up a nonprobability sample of audience segments within the general population, limiting the ability to generalize about the public at large. Focus group and interview data do not allow researchers to statistically control for demographic determinants such as education and income. Such methods rely on the skills of trained moderators and analysts to minimize introduction of bias.

The PEMDP teams adopted multiple measures to reduce potential bias and ensure reliability and validity. Standardized protocols ensured comparability of data across institutions. The scale of the PEMDP made possible the collection of data from over 1000 respondents from 7 states in 4 different US regions. Efforts ensured inclusion of minority groups.

The verification analysis was undertaken to test PEMDP results against research using multiple methods to answer comparable questions. The analysis combines the rigors of a systematic review of the literature with a synthesis of PEMDP results across categories of threats. PEMDP results were generally consistent with or complemented the existing literature. The analysis also made new findings possible.

## Conclusions

The PEMDP provides valuable lessons for communication in public health emergencies, prompting the following recommendations for agencies and professionals seeking to inform the public about biological, chemical, and radiation threats.

First, messages should emphasize simple, practical steps and basic information about the threat. They must rapidly provide people with clear instructions on self-protection measures and foster self-efficacy. Messages should be simple enough for people to understand under high-stress conditions when people cannot process information well, and action steps provided should appear feasible. Authorities must let people know specific protective actions and explain why these actions will keep them safe. Authorities must distinguish between and provide pertinent information to groups at different levels of risk (e.g., on the basis of proximity to the event). Spokespersons with credibility on health issues should deliver the messages.

Second, messages must be disseminated quickly. Information seeking for protective actions will be one of the first steps taken by individuals. The media can facilitate government officials’ emergency risk communication. Members of the public living in the area in which an emergency takes place will look to both local broadcast media and local authorities for information. People compare sources to validate the veracity and accuracy of this information, so consistency across sources is vital. Collaboration and integration of agencies responsible for risk communication preparedness before, during, and after an event can make this possible. Officials can foster trust by being open about official response, the information available, and protective actions during an emergency. All levels and areas of government (especially local officials and agencies with health expertise) should be involved in emergency risk communication.

Effective emergency messages are not a panacea for the challenges posed by emerging public health threats. Nevertheless, by rapidly providing people with the information they need, they can reduce morbidity and mortality and help maintain public confidence. In this regard, the lessons of the PEMDP may be useful as emergency planners and responders grapple with the challenges of emerging public health threats in coming years. j

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# Contributors

R. J. Wray, S. M. Becker, N. Henderson, and D. Glik were principal investigators and team leaders for the project, directed research for their institutions, and served as lead authors for the article. K. Jupka, S. Middleton, C. Henderson, and A. Drury collaborated as project managers for all phases of the research for their respective schools. E. W. Mitchell was project officer for the CDC and coordinated the work across institutions.

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# Human Participant Protection

This study was approved by the institutional review board at each collaborating university.

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