Risk Communication Training: Research Findings and Recommendations for Training Development

Report to the Resilient Systems Division,
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About This Report

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About START

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Executive Summary

Effective and consistent communication is essential for ensuring that communities are resilient to disasters (Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008; Chaskin, 2008; Sherrieb, Norris, & Galea, 2010). But despite the topic's importance, 80% of those individuals charged with disaster communication do not receive formal communication training, learning instead through experience (Coombs, 2007). This figure is troubling because effective communication is difficult to learn amidst disaster when careful yet quick decisions are necessary (Covello, Peters, Wojtecki, & Hyde, 2001). In an effort to combat this problem, the Department of Homeland Security's Resilient Systems Division identified the need for new, scientifically rigorous risk communication training. To that end, this report highlights the results of a needs assessment survey involving 140 risk communicators and an examination of 173 English-language risk communication training programs.

Based on this research, we determined that future risk communication training could incorporate a wider variety of delivery methods and training audiences, including:

- **Blended learning formats:** Only one of 173 analyzed trainings was delivered in a blended learning format. Yet, substantial evidence indicates blended formats improve learning outcomes compared to solely face-to-face or online formats (e.g., Ge, 2012; Lim, Morris, & Kupritz, 2007; Means et al., 2010). Survey respondents also largely called for risk communication trainings that combined on- and off-line delivery methods.

- **Training community-based audiences:** Survey respondents indicated that methods for working with community partners to better circulate risk information was a priority to them. Our analysis revealed, however, that this topic is under-developed in current training materials. The training analysis revealed that only 20.2% of risk communication trainings target community-based audiences, compared to 57.1% that target government audiences.

The combined findings also point to gaps between risk communicators' stated needs and current training options, including the following:

- **Event phases:** Only 15.3% of evaluated trainings covered all event phases, including preparedness, response, and recovery. In comparison, the majority of survey respondents indicated that their organizations communicate about risks across all phases. Ninety five percent reported that their organizations communicate preparedness messages, 88.6% reported they communicate response/warning messages, and 77.7% reported they communicate recovery messages annually. Finally, 72.9% of survey respondents indicated that their organizations communicate about risks across all phases.

- **Hazard-specific trainings:** An overwhelming majority of survey respondents (87.1%) reported that risk messages should differ according to hazard type. Conversely, only 38.3% of trainings focused on specific hazards.

- **Social media:** Survey responses highlighted the need for more social media training, particularly related to using social media during the preparedness phase, despite the fact that 45% of survey respondents reported having risk communication training on social media use in the past three years. Additionally, only 6.5% of the analyzed trainings included instruction on using social media to reach the public directly.

- **Special needs populations:** Risk communication literature suggests that certain populations may require customized messages (Janoske, Liu, & Sheppard, 2012; Sorensen, 2006). Among others, these populations include: low income communities; communities with low literacy rates and/or low-English fluency rates; immigrant or tribal groups; and transient communities. Special needs populations also include those with large numbers of children, elderly persons, individuals who are sensory-disabled, individuals who are developmentally disabled, and individuals with chronic physical or mental illness. Additionally, the special needs designation applies to areas in which people are geographically isolated or incarcerated, and some literature identifies communities with high rates of activist and/or militant populations as requiring special consideration as well. Despite existing research, only 5.3% of analyzed trainings covered topics related to special needs populations, and only 7.1% covered the need for cultural awareness of targeted audiences. Survey respondents ranked illegal immigrant populations, activists and/or militant populations, and transient populations as the groups with whom their organizations were least prepared to communicate.

- **Evaluation:** Only 27.1% of survey respondents reported attending training that covered risk communication evaluation. Further, only 25.9% of analyzed trainings taught learners to develop performance assessment measures or discussed the need to evaluate risk communication plans and performance.

These results provide important insights into the current state of risk communication trainings and will inform our ongoing effort to develop empirically-based risk communication guidelines, trainings, and evaluation tools.

Introduction

Effective and consistent communication is essential for ensuring that communities are resilient to disasters (Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008; Chaskin, 2008; Sherrieb, Norris, & Galea, 2010). Local leaders must be able to actively, effectively, and accurately communicate risks to communities before, during, and after disasters (Heath, 2006; Ulmer, Sellnow, & Seeger, 2011).[1] Consequently, the Department of Homeland Security's Resilient Systems Division identified the need to develop empirically based risk communication guidelines, trainings, and evaluation tools. As part of this two-year effort, the National Consortium for the Study of Terrorism and Responses to Terrorism (START) is working to develop, deliver, and evaluate a scientifically informed program focused on training local leaders in the United States. This report—an analysis of existing risk communication training combined with the results of a needs assessment survey—is part of a larger examination of the current state of risk communication research and training.

This report begins with a discussion of selected literature in fields related to training, with a particular emphasis on the instructional design process. Next, the report provides an overview of research on risk communication training. Following, the document reviews methods used to assess current training programs, training needs, and provides the findings from these assessments. Lastly, recommendations for developing future risk communication trainings are provided.

Training Defined

Training is an interdisciplinary field garnering insights from psychology, human resource management, and education, among others. As a result of these varied roots, the field's scholarship and trade literature encompass a large and disparate body of work with no clear consensus on how to define training or what makes training effective. Most scholars agree that the purpose of any training is to improve performance—at the individual, team, organizational, and/or community level (Aguinis & Kraiger, 2009; Blanchard, 2008; Goldstein, 1974; Goldstein & Ford, 2002; Nadler, 1984), but there are debates over how to refine this definition. Blanchard and Thacker (2004) characterize training as simply an "opportunity" for learning (p. 4), while other scholars argue that training is distinct from education because it tends to focus on skill development and behavioral change, while traditional education may focus more on abstract knowledge acquisition (Fitzgerald, 1992; McCausland, 2008). Goldstein (1974), however, argues that at their root, "[b]oth training and education are instructional processes designed to modify human behavior" (p. 3). The following sections outline select research on the topic, including: prominent instructional design models, training tools and methods, and training effectiveness.

[1] A disaster is a "serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources" (National Science and Technology Council, 2005, p. 21). Risk communication is the "process of exchanging information among interested parties about the nature, magnitude, significance, or control of a risk" (Covello, 1992, p. 359), and occurs when risks manifest into disasters (Heath, 2006). Finally, risk communicators are individuals who engage in risk communication activities, as a formal or informal part of their work responsibilities, during all event phases (preparedness, warning/response, and recovery).

Instructional Design Process

The *Annual Review of Psychology* has charted scholarly developments in the training field since 1971 through the regular publication of training reviews (Aguinis & Kraiger, 2009; Campbell, 1971; Goldstein, 1980; Tannenbaum & Yukl, 1992).

Four decades of training research indicate that most scholars conceptualize training as a process, rather than as an individual program or set of programs, with a focus on how curriculum developers create their materials. Most scholars identify the instructional design process as a well-established and theoretically rigorous approach to developing effective training programs (Gagne & Briggs, 1979; Noe & Colquitt, 2002). Instructional design involves the systematic analysis of human performance problems by discovering their root causes and developing and implementing solutions to solve those problems (Rothwell & Kazanas, 2008). Research suggests that there are multiple means to approach this process. In this review, we highlight scholarship on three of the most widely referenced instructional design models: *the ADDIE Model,* the *Dick and Carey Systems Approach,* and *Kemp's Instructional Design Model.*

ADDIE Model

A well-known framework for guiding instructional design is the ADDIE model[2]—***A***nalysis, ***D***esign, ***D***evelopment, ***I***mplementation, and ***E***valuation (Chevalier, 2011; Rothwell & Kazanas, 2008; Rothwell & Sredl, 2000; Visscher-Voerman & Gustafson, 2004). The ADDIE approach is at the core of instructional design and is the most dynamic and flexible model (Instructional Design Central, 2012). Figure 1 below summarizes the ADDIE model's phases.

Figure 1: The ADDIE Model

Phase	Description
Analysis	Clarify the instructional problem; conduct an assessment to identify learner characteristics and needs; take into account the learning environment; identify potential obstacles
Design	Make instructional strategy and delivery choices
Development	Create content and learning materials
Implementation	Test prototypes with targeted audiences, then put training into full production
Evaluation	Conduct evaluations after each phase and after the conclusion of the training

(Chevalier, 2011; Rothwell & Kazanas, 2008; Visscher-Voerman & Gustafson, 2004)

Chevalier (2011) argues that many organizations use an abbreviated version of the ADDIE model that relies on little analysis. As a result, he suggests that trainings are often built on questionable foundations. Other scholars have extended ADDIE, noting that while ADDIE lists five phases in linear order, they are in practice interrelated, and training developers typically perform the tasks within them in an iterative and cyclical manner (Rowland, 1992; van Merriënboer, 1997; Visscher-Voerman & Gustafson, 2004). The

[2] The ADDIE model is part of a more specific school of thought called instructional systems design (ISD), which focuses on collaboration between a curriculum writing expert and subject matter expert. This process separates training development from individual course design.

ADDIE model is traditionally used by instructional designers and training developers (Instructional Design Central, 2012).

Dick and Carey Systems Approach Model

The Dick and Carey Systems Approach model elaborates on the ADDIE model's core components and requires that the designer create a product with accomplishable objectives and measurable outcomes (Brandt, 2001). This model is an iterative cycle consisting of nine distinct steps, as follows:

1) Conduct a needs assessment to identify learning goals;
2) Conduct an instructional analysis and analysis of learners and contexts;
3) Write performance objectives;
4) Create assessment instruments;
5) Formulate instructional strategies;
6) Develop and choose instructional material;
7) Develop and conduct formative[3] evaluations;
8) Revise instruction based on evaluation feedback; and
9) Develop and conduct summative[4] evaluation (Dick, Carey, & Carey, 2001).

Extensive research supports the Dick and Carey model, arguing that it has applicability to a variety of contexts, including both the workplace and traditional classrooms (Brandt, 2001; Gustafson & Branch, 2002). The Dick and Carey model takes a systems approach to instructional development, which has resulted in criticism that it is too focused on specified objectives and does not adequately account for the learner's actual behavior (Qureshi, 2004).

Kemp's Instructional Design Model

Kemp's Instructional Design Model also builds on the ADDIE framework (Morrison, Ross, & Kemp, 2004). Like the Dick and Carey Systems Approach Model, Kemp's Instructional Design Model consists of nine distinct but interdependent steps:

1) Identify instructional problems and specify goals for designing an instructional program;
2) Examine learner characteristics that should receive attention during planning;
3) Identify subject content and analyze task components related to stated goals and purposes;
4) State instructional objectives for the learner;
5) Sequence content within each instructional unit for logical learning;
6) Design instructional strategies so that each learner can master the objectives;
7) Plan the instructional message and delivery;
8) Develop evaluation instruments to assess objectives; and
9) Select resources to support instruction and learning activities (Morrison, Ross, & Kemp, 2004).

[3] Formative evaluations are conducted during the development of a training program with the intent to improve the program before it is implemented (Scriven, 1991). Examples of formative evaluation include piloting a portion of a training simulation and sending draft materials to colleagues to review. It is important to receive feedback from your target audience during formative evaluation (Scriven, 1991).

[4] Summative evaluation occurs when training is completed to assess whether the program effectively taught what it was supposed to teach (Kraiger, 2002). Summative evaluation is concerned with assessing the learning materials and learning process, which is different than a learner assessment. Learner assessments emphasize individual performance.

The Kemp Instructional Design model entails a strategic process that guides the curriculum designer through to a clear goal. Although structured, the model is also adaptable to whatever creativity designers may want to bring into the process (Gustafson & Branch, 2002). Unlike the Dick and Carey model, however, the Kemp model goes into greater detail on the early stages of content development and analysis. Additionally, unlike other instructional design models it focuses on resources and services available to support instruction and learning activities (Qureshi, 2004).

Despite nuanced differences among them, the ADDIE, Dick and Carey, and Kemp models rely on the same foundation—they argue for the importance of assessing the needs of learners and identifying instructional problems before commencing content development. These models also converge in their emphasis on both formative and summative evaluation throughout the design process. However, given the ADDIE model's historical use in training development, and its ability to accommodate the instructional design process, we have chosen to use this framework to guide the development of our future risk communication trainings.

Training Methods

In the early stages of training development, instructional designers must make several foundational decisions about their approaches to training methods. First, trainers should ensure a thorough understanding exists that will guide them when considering the various mechanisms through which people learn. Training scholarship focuses on three primary approaches to learning: cognitive methods, behavioral methods, and affective or attitudinal models. Cognitive methods demonstrate conceptual linkages and relationships among ideas and provide the rules and theories behind actions. In contrast, behavioral methods allow trainees to practice specific learned behaviors in a real or simulated environment, thereby going beyond the purely intellectual learning of cognitive methods (Blanchard & Thacker, 2004). Affective or attitudinal models emphasize the need for growth in learners' feelings or emotions, arguing that linking instruction to the affective domain[5] makes learning more memorable and ultimately effective (Baartman & de Bruijn, 2011; Bloom, 1956).

Trainers must make decisions on the methods they will use in their training development. Training scholarship includes work on methods such as: electronic-based learning, reference methods, providing examples, small group trainings, and games and simulations (Blanchard & Thacker, 2004). Figure 2, displayed on the following page, summarizes some of these common training methods, provides examples of each method, and notes advantages and disadvantages associated with each one.

[5] Bloom (1956) developed a taxonomy of the affective domain, which progresses from the simplest behavior to the most complex: 1) receiving—becoming aware of environment; 2) responding—actively participating and behaving differently because of experience; 3) valuing—attaching worth, which may range from acceptance to commitment; 4) organization—prioritizing values; 5) characterization of value—behavior becomes consistent, predictable, and characteristic of the learner (Krathwohl, Bloom, & Masia, 1999).

Figure 2: Common Training Methods

Methods	Examples of Training Tools	Description	Advantages	Disadvantages
Large group methods	Lectures; discussions; demonstrations	Presentation of information to a larger group, often in a less collaborative and more lecture-based format	Can train many people at once; cost effective	Hard to identify and correct misunderstandings
Electronic-based training	Programmed instruction; interactive multimedia training; intelligent tutoring systems; virtual reality	Trainings that occur through the use of a computer	Reduces trainee learning time; lowers cost; increases access to training and instructional consistency; learner guided	Labor-intensive to develop; requires knowledge of programming and computer skills; potential for cheating
Reference methods	Workbooks; study guides; training manuals	Materials that offer training information that learners can utilize according to their needs	Learners can work at a self-guided pace	Lack of feedback from trainers and peers
Small group trainings	Discussion groups; workshops; seminars; team building	Presentation of information to a smaller group, often in a more collaborative and discussion-based format	Allows for more one-on-one attention from trainer; participants can learn from each other	Trainings may be less structured
Games and simulations	Equipment simulators; business games; case studies; role play	Reproductions or simulations of events or circumstances that occur on the job	Provides experience of events in a controlled setting; creates safe setting if mistakes are made; engages both cognitive and affective processes; motivates trainees to actively engage with material	Development costs can be high

(Blanchard & Thacker, 2004; Garris, Ahlers, & Driskell, 2002; Granland, 2001; Petroski, 2012; Sitzmann, 2011; Smith, 2004; Tennyson & Jorczak, 2008; Wilson, 2000)

Research suggests that trainers should choose an approach/approaches to learning styles and methods after identifying performance gaps within the training audience (Chevalier, 2011; Rothwell & Kazanas, 2008; Rothwell & Sredl, 2000; Visscher-Voerman & Gustafson, 2004).

Trainings may include multiple methods of instruction based on their learning goals, curriculum content, audience characteristics, and organizational culture, among others. Blended learning, which often involves instruction that utilizes both online[6] and face-to-face learning environments, is now a standard part of education and training lexicon. Scholars suggest that the blended learning format helps to meet the demands of heterogeneous audiences (Bonk, Kim, & Zeng, 2006). Blended learning typically extends in-person instruction online and can include elements of: group work, on-site exercises, webinars, synchronous online conferencing, asynchronous self-paced study, and face-to-face classroom instruction (Cheung & Hew, 2011; Farmer & Wilding, 2012; Singh, 2003). While research on blended learning is still emerging, scholars agree that training producers should utilize the method alongside careful consideration of the program's learning outcomes (Boyle, 2005), which is congruent with the instructional design process detailed previously. A blended learning program may combine one or more of the dimensions discussed in Figure 3 (Singh, 2003).

Figure 3: Blended Learning Program Dimensions

Blend Type	Example
Offline and online learning	Provide study materials and resources online with instructor-led, classroom training sessions as the primary instruction method
Self-paced (asynchronous) and live, collaborative learning (synchronous)	Allow self-paced review of relevant literature followed by a moderated discussion (live or online) about application of the literature to a particular job context
Structured[7] and unstructured[8] learning	Archive conversations and documents from unstructured learning within repositories that can then be used for structured learning environments
Learning, practice, and performance support	Supplement structured online and offline learning with practice, such as exercises, simulations, or on-the-job experience

(Adapted from Singh, 2003)

Research indicates that attending to multiple learning styles in a single program may result in higher retention rates (e.g., Kolb, 1984; Sellnow & Seeger, 2010). Kolb (1984) argues that knowledge is "created through the transformation of experience" (p. 41). He suggests that this process occurs in stages,

[6] Online training methods fall into two broad categories: asynchronous and synchronous. In asynchronous training students may review materials and/or communicate with instructors and peers at any time (Fenton & Watkins, 2010). In synchronous teaching, instruction occurs in real time, with students and instructors sharing information in the same electronic location (not physical location) at the same time (Fenton & Watkins, 2010).
[7] Structured learning refers to learning that occurs in a premeditated and formal learning program (Singh, 2003).
[8] Unstructured learning refers to learning that occurs outside of a formal program, such as work meetings, e-mail, or hallway conversations (Singh, 2003).

including: concrete experiences, abstract conceptualization, reflective observation, and active experimentation. Other scholars support the idea that the most effective trainings will attend to all of these stages. Sellnow and Sellnow (2010) find that attending to all stages of knowledge acquisition is not only important for training development, but also for effectively designing risk messages.

Training Effectiveness

Given the amount of time and effort it takes to design training programs, it is natural to wonder how effective[9] an investment in training might be and how trainees will apply new skills to their jobs. The 2011 *State of the Industry Report* from the American Society of Training and Development (ASTD) notes that businesses in the United States spent $171.5 billion on training in 2010. Despite this high rate of investment, past studies show that much organizational training fails to result in application to job performance (Tannenbaum, 2002). Many scholars and trainers make the common statement that less than 10% of information learned in trainings is transferred to the job (Aik & Tway, 2005; Brown, 2005; Burke & Hutchins, 2007; Lim & Morris, 2006). Other scholars, however, argue that this percentage is not based on empirical evidence and does not identify what is or is not transferred to job performance (Ford, Yelon, & Billington, 2011; Saks, 2002). Regardless of the exact percentage of skills transferred, scholars agree that there is a loss of information that occurs between training and on-the-job performance (Arthur, Bennet, Stanush, & McNelly, 1998; Chiaburu & Marinova, 2005; Tannenbaum, 2002). Ultimately, information retention and skill transfer will depend on training methodology, content, and the people involved in the information exchange.

Some scholars argue that training can fail to align with organizational strategy, thereby contributing to the gap between training and job performance (Carnevale, Gainer, & Villet, 1990; Casner-Lotto & Associates, 1988; Montesino, 2002). Some of these scholars suggest that training developers must have a working knowledge of organizational culture (norms, standards, and values) if they are to reach their trainees effectively. Research also suggests that the failure to align training and organizational strategy results from inadequate needs assessment during the analysis phase of the instructional design process. Blanchard and Thacker (2004) argue that effective trainings must be developed with long-term vision for meeting individual and organizational needs.

Part of training effectiveness includes knowing who needs to be trained. Some organizations only train a small group of employees. Tannenbaum (2002) contends that organizations should include external stakeholders, such as community leaders, building managers, and journalists in training programs in addition to employees. Training these external stakeholders can increase strategic relationships. In a risk communication context, these community relationships are critical for increasing risk toleration and disaster preparation (Heath & Abel, 1996; Palenchar, 2010).

Trainings can focus on audience members who will then train others. This train-the-trainer (TTT) educational model is especially common in public health and health care fields (Corelli, Fenlon, Kroon, Prokhorov, & Hudmon, 2007; Orfaly et al., 2005). The TTT model is based, in part, on adult learning

[9] Broad and Newstrom (1992) defined transfer of training as "the effective and continuing application, by trainees to their jobs, of the knowledge and skills gained in training—both on and off the job" (p. 6). Other scholars defined effectiveness as "the match between results achieved and those needed or desired" (Rothwell & Kazanas, 2008, p. 6).

theory,[10] which posits that people who train others remember nearly all of the material they teach. The model also draws on diffusion of innovation theory,[11] which argues that people adopt new information and ideas through their networks of social connections (Hill, Palmer, Klein, Howell, & Pelletier, 2010). While research shows that the TTT model can be successful, it is important to note that there are no mandated methods for implementing a TTT model or mechanisms for quality control. Consequently, training designers must be willing to adapt the model as necessary to their specific audiences based on needs assessments (Orfaly et al., 2005).

Despite studies challenging the effectiveness of training, other research proposes that effective training can have a positive impact on individuals, teams, and organizations (Aguinis & Kraiger, 2009). For example, Arthur, Bennett, Edens, and Bell (2003) conducted a meta-analysis of 165 studies on training-related topics and find that training positively affected job-related performance. Importantly, effectiveness varied depending on the delivery method and on the emphasized skill set, with trainings including both cognitive[12] and interpersonal[13] skills as the most effective. For instance, research shows the importance of customized trainings that offer personalized feedback and recommendations that address trainees' strengths and weaknesses (Brown & Ford, 2002; Tannenbaum, 2002). Research also shows that online training allows trainees to be in control of instruction, shaping and guiding the training content according to their particular needs. For example, trainees can exercise greater control through selecting modules and choosing the pace at which they will complete training (Khan, 2001; So, Lossman, Lim, & Jacobson, 2009; Taylor, Miro, Bookbinder, & Slater, 2008).

In 2009 the U.S. Department of Education conducted a meta-analysis and review of more than one thousand empirical studies of online learning in both K-12 and post-secondary education from 1996 to July 2008. This report cites evidence that blended learning is more effective than using only face-to-face or online learning in isolation because blended conditions often included additional learning time and more instructional elements (Means, Toyama, Murphy, Bakia, & Jones, 2010). In another study, Ge (2012) compares two classes of e-learners, comprised of one class using only cyber-asynchronous learning and the other class using a blended learning environment of cyber-asynchronous and -synchronous learning. Ge's (2012) results suggest that a blended approach of asynchronous and synchronous learning can result in increased student-teacher interactions, which subsequently improve student learning gains. Research suggests that blended learning is effective because it allows learners to engage with course materials in a variety of ways (Lim, Morris, & Kupritz, 2007).

Risk Communication Training History

Risk communication as an organized field developed following new legal and regulatory measures in the mid-1980s. These measures provided citizens with publicly accessible information about potential environmental and health risks within their communities, such as risks posed by chemical plants

[10] Adult learning theory suggests several principles that underlie effective adult learning for adults, including: the need to know why adults should learn something, a desire to learn the practical and theoretical, a motivation to learn in participatory and active settings, and a desire to be self-directed (Green & Ellis, 1997; Kurtz, Silverman, & Draper, 1998).
[11] Everett Rogers popularized the diffusion of innovation theory starting 1962. More information about the theory can be found in Rogers, E. (2003). *Diffusion of innovation* (5th ed.). Free Press: New York, NY.
[12] Cognitive skills are skills that relate to thinking, problem solving, idea generation, or specific knowledge requirements of the job (Arthur et al., 2003).
[13] Interpersonal skills are techniques necessary to interact in a workgroup or with clients and customers. These include, but are not limited to, communication skills, leadership skills, conflict management skills, and team building skills (Arthur et al., 2003).

(Palenchar & Heath, 2007; Palenchar, 2008). These new provisions also elevated formal risk assessments, which often came under the purview of the fledgling Environmental Protection Agency (EPA) (Palenchar, 2008).[14] While general concern for the environment and communal risks became a topic of public discussion, environmental disasters like Three Mile Island expedited attention to issues of risk and eventually produced the "Right-to-Know" act of 1986 (Perrow, 1981). As part of an early EPA initiative, Covello and Allen (1988) initially created a pamphlet entitled "Seven Cardinal Rules of Risk Communication," which formed the foundation of the EPA's approach to risk communication.[15]

In 1980, professionals from a range of relevant fields founded the Society for Risk Analysis to provide an open forum for risk assessment, characterization, communication, management, and policy (Society for Risk Analysis, 1993). Even before the creation of the Risk Analysis Society, social science academic centers began to focus on the study of risk. In 1963, the Disaster Research Center at the University of Delaware became one of the first centers to conduct risk research (Palenchar, 2008). The Center for Risk Analysis at the Harvard School for Public Health emerged in 1989, and more recently, the University of Georgia established its Center for Health and Risk Communication (Palenchar 2008). Risk today is conceptualized as not only technical (more specifically as actuarial, environmental, and technological) but also as emotional or political (Renn, 1998; Slovic, 1999).

As risk communication research centers and programs proliferated, they moved to translate their research into training programs. In 1989, the Association of State and Territorial Health Officials (ASTHO) conducted one of the first studies to examine risk communication training: a survey of 128 health commissioners and staff in 48 states and territories (Chess, Salomone, & Sandman, 1991). This research found that 87.3% of respondents "agreed" or "strongly agreed" that "risk communication training is important to improve agency efforts;" and 75.8 % "agreed" or "strongly agreed" that "a major barrier to environmental risk communication is insufficient training for new and existing staff" (Chess et al., 1991, p. 4). This study also found that agencies spend more time responding to requests for information than initiating dialogue with stakeholders or alerting the public about risks.

A notable effort to create institutionalized risk communication training began in 2001, when the Centers for Disease Control and Prevention (CDC)'s Office of Communication started working on a Crisis and Emergency Risk Communication (CERC) training program in collaboration with Prospect Associates, the American Institutes for Research, and the Oak Ridge Institute for Science and Education (Courtney, Cole, & Reynolds, 2003). Both 9/11 and the Washington, DC anthrax attacks heightened public outrage, prompting significant government response (Reynolds & Seeger, 2005). Completed in 2002 and updated in 2012, the CERC program is still among the most prominent models in the field. CERC is also unique because of its emphasis on a train-the-trainer model (Reynolds & Seeger, 2012).

While many groups and individuals utilize CERC training and adapt it to their needs, organizations may develop their own trainings to address local communities' specific needs. For example, the Kansas

[14] In addition to the EPA, a number of other federal agencies are involved with risk and crisis communication, including the: Central Intelligence Agency, Department of Agriculture, Department of Defense, Department of Energy, Department of Health and Human Services, National Institutes of Health, Department of Homeland Security, Federal Emergency Management Agency, Transportation Security Administration, Department of Interior, Department of Justice, Department of Labor, Department of State, Department of Transportation, Federal Aviation Administration and Federal Railroad Administration, Department of Treasury, and Nuclear Regulatory Commission (Palenchar, 2008).

[15] Covello and Allen's (1988) "Seven Cardinal Rules of Risk Communication" are as follows: 1) Accept and involve the public as a legitimate partner, 2) Plan carefully and evaluate your efforts, 3) Listen to the public's specific concerns, 4) Be honest, frank, and open, 5) Coordinate and collaborate with other credible sources, 6) Meet the needs of the media, and 7) Speak clearly and with compassion (p. 1).

Department of Health and Environment (KDHE) conducted, developed, and delivered a train-the-trainer workshop to teach partner agencies about effective rural risk communication messaging based on findings from 2003 telephone focus groups (Heideman & Hawley, 2006). Unlike CERC, this training focused on utilizing message maps[16], fulfilling a particular need identified by the local communicators.

Current Study and Methods

Although there is no single method for developing effective trainings, the identified literature demonstrates that trainers must carefully consider learning approaches and training methods prior to content development. To date, research has not comprehensively examined existing risk communication trainings nor has it surveyed those responsible for communicating risk to identify their training needs. To fill this gap, a content analysis of existing risk communication trainings and a needs assessment survey of risk communicators is detailed below.

This section explains methods used to collect data on current training and training needs related to risk communication. For data collection purposes, we define risk communication training as any instructional process designed to improve risk communication performance or to modify the public's behavior related to risks, whether the instructional process focuses on hands-on skills and/or more abstract knowledge. These training approaches may include: one-day courses (online and in-person), multi-day courses (online and in-person), conferences, workshops, seminars, webinars, reference materials, and exercises/or simulations.

Content Analysis of Existing Training: Sample and Coding Protocol

We collected 173 English-language trainings from all available development and delivery sources including: the federal government (40), state and local governments (13), universities (55), the private sector (25), nonprofits (21), and foreign governments (19). See Appendix A for a list of training producers.[17]

We searched for risk communication trainings between September 2011 and July 2012, and included trainings with a focus on the public good,[18] as public sector communication often has different goals than corporate and/or private sector communication during disasters.[19] We did, however, include trainings from private sector organizations that demonstrated a focus on the public good, either through content or target audience.

First, to locate curricula we used Google to conduct a preliminary search for risk communication-related trainings using the search phrases *"risk communication training," "risk communication course," "risk communication seminar," "risk communication webinar," "risk communication guidebook," "risk communication workshop," "risk communication toolkit," "risk communication conference,"* and *"risk communication simulation."* In order to address terminological differences that exist within the risk

[16] Messages maps are visual tools that organizations can use to help create consistent risk messages (Covello, 2002).
[17] Many producers developed more than one training program.
[18] While there is no single conceptualization of the public good, to operationalize this concept for our study we focused on trainings that dealt with risk communication geared towards emergency management, disaster preparedness, homeland security, environmental safety, public health, and community engagement.
[19] Corporate models of disaster communication primarily focus on reputation management, profitability, and acceptance of blame, whereas public sector disaster communication prioritizes meeting the public's information and safety needs (Horsley, 2012; Liu, Horsley, & Levenshus, 2010).

communication field, we expanded the search terms to include *"crisis communication," "emergency communication,"* and *"emergency risk communication"* to capture all relevant trainings. To ensure our data collection remained up-to-date, we used Google Alerts to aggregate the latest news on the topic of risk communication. Google Alert search phrases included *"crisis communication," "emergency communication," "risk communication," "disaster preparedness," "emergency management,"* and *"risk communication training."*

To find additional risk communication trainings, we conducted an expanded database search of LexisNexis Academic, Homeland Security Digital Library, Medline, Education Research Complete, Education Resources Information Center (ERIC), and Communication & Mass Media Complete. For each database we used the search terms *"risk communication training," "risk communication education," "risk communication," "training,"* "*risk communication," and "education."* We searched LexisNexis Academic for all major world publications from 1980 to find any relevant articles regarding risk communication training programs that may have pre-dated our Google Alerts search. We used the Homeland Security Digital Library database for its particular relevance to federal agency trainings. We also consulted the Medline database as a way to search for more health-focused risk communication trainings. We further consulted Education Research Complete and ERIC because of their focus on a range of topics related to education and learning. Finally, we searched Communication & Mass Media Complete because of its particular focus on communication research.

To develop coding protocol, we used Glaser and Strauss's (1967) grounded theory approach. Specifically, we used the constant-comparative method to identify trainings' characteristics (e.g., training producer, program title, duration, dates/locations) and content areas (e.g., learning objectives, training methods, topics of focus, target audiences, and evaluation methods) for an initial coding scheme. After using this initial coding scheme to catalogue findings in an Excel spreadsheet, we created a final coding scheme by merging findings into overarching categories (Corbin & Strauss, 2008). One coder collected the trainings and coded the data. Then, two additional coders reviewed the data for consistency and accuracy.[20] Appendix B presents the final coding scheme.

Survey: Sample and Instrument

Alongside our training content analysis, we conducted an online needs assessment survey of 140 risk communicators between July and August 2012. Appendix C provides the full survey instrument, and Appendix D displays survey respondents' aggregated organizational profiles.

For sample inclusion we defined risk communicators as individuals who engage in risk communication activities as a formal or informal part of their work responsibilities, during any event phase (preparedness, warning/response, and/or recovery). The sample thereby included individuals formally identified as risk communicators, such as public information officers and emergency managers, as well as individuals in positions less traditionally associated with risk communication, such as utility company representatives, building managers, community activists, and volunteer coordinators, among others.

[20] Coding combined qualitative inductive coding and quantitative deductive coding conducted by one researcher. This approach allows for high data stability, one important form of reliability. A significant limitation of this approach, however, is that the data may not be fully reproducible (Gottschalk, 1995). To address this limitation, we triangulated the content analysis findings with the survey findings and extant literature (Yin, 2009).

Prior to disseminating the survey, we conducted a pre-test with five risk communication experts (four practitioners and one researcher).[21]

We used snowball, purposive, and convenience sampling methods to generate the largest and most diverse sample possible:[22]

1. We began with a snowball sampling method[23] by asking a group of risk communication experts who participated in a START risk communication workshop[24] to recommend potential survey respondents. This request yielded a list of 1,091 potential respondents.[25]

2. Next, we used a purposive sampling method[26] to expand the sample to include individuals who: serve as communicators for a community; are involved in emergency management, either professionally or as volunteers; and/or serve as so-called "leaders" within their respective communities. We found these individuals through an online search of state and local emergency management agency websites, Community Emergency Response Teams (CERT), state emergency management associations, and community action associations. We also invited Federal employees whose names and contact information were listed in attendance rosters for past risk communication trainings or seminars. Additionally, we contacted the executive directors of prominent professional associations,[27] asking them to distribute the survey to their contact lists.

3. Finally, we used convenience-sampling methods[28] to distribute the survey link to prominent risk communication listservs.[29]

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[21] The survey pre-test resulted in only minor changes to the survey, including: the addition of Reverse 911, Emergency Alert System (EAS), and an opt-in alerting system to the types of channels participants used to communicate risk, inclusion of N/A (not applicable) option for question 20 regarding the capacity to implement national plans for emergency preparedness, response, and recovery, and the inclusion of question 29 that asked participants to enter the number of trainings attended that focused partially, but not completely, on risk communication.

[22] Due to time and cost constraints we were not able to utilize a random sample for this study.

[23]Snowball sampling involves contacting known respondents who then recommend others as participants in the research. Research participants included through snowball sampling should not be considered representative of the entire population (Nardi, 2003; Wimmer & Dominick, 2003).

[24] START hosted a February 2012 academic and practitioner workshop to map out effective risk communication knowledge and research gaps. The results of this workshop are discussed in Mileti, Dennis, Monica Schoch-Spana, and Stephanie Madden's "Setting the Standards: Best Practices Workshop for Training Local Risk Communicators," Report to Human Factors/Behavioral Sciences Division, Science and Technology Directorate, U.S. Department of Homeland Security. College Park, MD: START, 2012.

[25] These potential participants included 61 public information officers from the Los Angeles, New York, and Washington, DC metropolitan areas; 380 community leaders from FEMA Region VII (Iowa, Kansas, Missouri, and Nebraska); 628 individuals on Local Emergency Planning Committee distribution list from the Baltimore, MD region; and 22 other individuals actively involved in risk communication such as local emergency preparedness task force coordinators, chairs and board members of the National Voluntary Organizations Active in Disaster (VOAD), and city managers.

[26] Purposive sampling involves choosing a particular group or individuals to study because they possess specific traits (Nardi, 2003).

[27] The contacted professional associations were the National Association of Government Communicators, National Governors Association, International Association of Emergency Managers, National Council of Nonprofits, National Public Health Information Coalition, National Association of Professional Geriatric Care Managers, and the Association of Public Safety Community Officials.

[28] A convenience sample (also called an available sample) is a group of ready participants for study. While such samples cannot produce results generalizable to the entire population, they can help collect exploratory information about a phenomenon (Wimmer & Dominick, 2003).

All potential participants received an email invitation with a link to the online survey. It is important to note that a major limitation of this recruitment approach is that the survey results are not generalizable to all risk communicators given that we did not have a random sample. In addition, we cannot calculate the response rate because we do not know how many individuals received the survey invitation from our convenience sampling. However, given that risk communicators come from such diverse backgrounds, the sampling approach allowed us to maximally reach a diverse set of risk communicators.[30]

The 32-question survey instrument used five question types[31] to gather information on participants' job positions, characteristics of the organizations they represent, the geographic area and populations they serve, communication channels their organizations employ, hazards they communicate about, past training experiences, and future training needs. We used the findings from a workshop of 26 risk communication experts and two comprehensive risk communication literature reviews (Janoske, Liu, & Sheppard, 2012; Mileti, Schoch-Spana, & Madden, 2012; Sheppard, Janoske, & Liu, 2012) to help develop the survey content.

[29] Listservs included: The First Responder Community User Forum at FirstResponder.gov, the Risk Communication Forum on the Lessons Learned Information Sharing (LLIS.gov) network, and the Emergency Management Institute's (EMI) Higher Education conference attendees and listserv participants.

[30]Funding permitting, future risk communication training research may wish to offer compensation for survey participation to increase the response rate, which was low for this study. Other methods for increasing response rates include obtaining a professional association's endorsement of the survey; combining telephone, mail, and online data collection methods; and collecting the data over a longer period of time and/or different time of the year (Dillman, 2000).

[31] The survey included 1) free-form response questions that allowed participants to respond to questions using their own words, 2) multiple-answer questions that allowed participants to check all answers that applied, 3) yes/no questions, 4) single choice questions that required participants to choose one of the answers provided, and 5) scale questions that required participants to indicate their responses using a rating scale (e.g., from 1 (weak) to 5 (strong)).

Results

Risk Communication Training Participation

Respondents indicated that they attend on average slightly more than two exercises, drills, and/or simulations per year on risk communication. Online courses and webinars were also common training types, with respondents attending an average of 2.1 (Standard Deviation *(SD)* = 3.7) online courses and 1.9 (*SD* = 3.6) webinars focused specifically on risk communication. Respondents participated in an average of 2.9 (*SD* = 8.0) online courses with a risk communication component per year.

Table 1: Survey Respondents' Risk Communication Training Participation

Training Type Sample Size (*n* = 140)	**Training Sessions Per Year (average)**	**Standard Deviation (*SD*)**
Training Focused on Risk Communication		
Exercises/drills/ simulations	2.5	4.0
Online courses	2.1	3.7
Webinars	1.9	3.6
One-day training course (on-site)	1.6	3.4
Conference/seminar opportunities	1.4	2.1
One-day training course (off-site)	1.2	2.6
Multi-day training course (off-site)	0.8	1.4
Multi-day training course (on-site)	0.7	1.2
Training with a Risk Communication Component		
Online courses	2.9	8.0
Webinars	2.0	4.1
Exercises/drills/ simulations	2.0	3.0

Conference/seminar opportunities	1.4	2.3
One-day training course (on-site)	1.3	3.2
Multi-day training course (off-site)	1.1	2.2
One-day training course (off-site)	1.0	1.8
Multi-day training course (on-site)	0.7	1.4

Risk Communication Training Delivery

Online trainings/webinars accounted for only 28.9% of the 173 analyzed trainings (see Table 2, below). As noted above, survey respondents reported attending on average 2.1 online courses and 1.9 webinars focused specifically on risk communication. Only one of the analyzed trainings was delivered in a blended learning format.[32]

Further analysis of the inventory's 50 online trainings revealed that 86% were asynchronous, meaning that trainees take the trainings at their convenience versus needing to participate in all or part of a training program at a specific time. Furthermore, 62% of online trainings followed a module format, with each module focusing on a different topic area. The level of interactivity varied among these courses, with most interactivity occurring in the form of pre-test, quiz, and/or post-test evaluation. None of the trainings required participants to submit subjective, non-test assignments for feedback from instructors.

Table 2: Training Delivery Options

Training Delivery Options	Total (*n* = 173)	Percentage
In-person	104	60.1%
Online/webinars	50	28.9%
Reference materials	19	11.0%

[32] The only observed blended format was online asynchronous and synchronous.

Lecture sessions were the most prevalent training tool across trainings (56.1%). Using simulations, exercises, and/or scenarios was the second most prevalent approach (39.3%). Table 3 provides a breakdown of remaining approaches.

Table 3: Training Tools

Training Tools	Total (*n* = 173)	Percentage
Lecture	97	56.1%
Simulations/exercises/scenarios[33]	68	39.3%
Discussion/panels	45	26.0%
Case studies	43	24.9%
Worksheets/templates/manuals/handouts	34	20%
Videos	16	9.2%
Not specified	12	6.9%

Note: Some of the 173 analyzed trainings employed multiple training tools.

Survey respondents detailed an interest for more in-person trainings with individuals working at regional and local levels. Some respondents noted an interest in providing training opportunities for broader, local communities, outside of traditional risk communication professions.

In addition to more local, in-person trainings, survey respondents expressed interest in the development of new, online trainings spanning substantial lengths of time (i.e., extending beyond self-paced trainings that can be completed in one sitting), as well as more inclusion of blended learning environments that combine in-person and online elements into the same training. Additionally, respondents recommended including more hands-on components in trainings to practice new skills.

Finally, survey respondents expressed interest in more "take-away" documents or kits, including toolkits of templates and resources emergency managers could draw from to improve risk communication. Another related suggestion was to increase resource sharing in trainings, such as sharing "pre-written messages for state and local agencies so that everyone can utilize each other's resources and start with the same basic information and template."

Risk Communication Training Topics: Overview

Survey findings indicated that most respondents previously completed trainings covering the National Incident Management System (NIMS)/Incident Command System (ICS), with 71.4% attending a training program on this subject in the past three years. Best practices in risk communication additionally were a

[33] While distinctions do exist between simulations, exercises, and scenarios, we coded these together in our analysis as they all require participants to think through a situation and practice learned skills.

popular emphasis with 59.3% of respondents attending related trainings. Only 27.1% of respondents attended training on evaluating risk communication, and even fewer—10.7% of respondents—attended training on audience analysis (see Table 4 below).

Table 4: Survey Respondents' Training Topics Covered in Past Three Years

Training Topics Covered in the Past Three Years	Total (n = 140)	Percentage
National Incident Management System/Incident Command System	100	71.4%
Best practices	83	59.3%
Addressing specific hazards	73	52.1%
Community engagement	71	50.7%
National Response Framework	71	50.7%
Social media	63	45.0%
Special populations	61	43.6%
Communicating preparedness	57	40.7%
Media relations	56	40.0%
Relationship building	54	38.6%
Public warnings	51	36.4%
Risk perception	50	35.7%
Communication channels	47	33.6%
Developing messages	47	33.6%
Addressing obstacles/challenges to communication	39	27.9%
Developing a communication strategy or plan	39	27.9%
Cross-cultural communication	38	27.1%
Evaluating your communication	38	27.1%
Non-verbal communication	36	25.7%
Spokesperson training	30	21.4%
Communication for mitigation	27	19.3%
Theories of risk communication	27	19.3%
Understanding and building trust	24	17.1%
Choosing the messenger	23	16.4%
Audience analysis	15	10.7%

Survey respondents provided additional feedback about the need to adapt risk communication training topics to participants' varied backgrounds. Answering an open-ended question about how to improve future trainings, respondents expressed interest in advanced trainings for more experienced practitioners. One respondent suggested a tiered system of trainings that would involve basic, intermediate, and advanced options; another respondent echoed this sentiment, stating that "[it] seems like there's a lot of basic level risk comm or crisis comm courses," and that s/he "would like to see a professional or expert level course and even a brief refresher/update of latest techniques and recent real-life examples for seasoned risk comm/crisis comm folks." Respondents recommended offering refresher

courses for those who completed previous trainings, either to refresh learned skills or to acquire new knowledge to stay current with the latest developments in the field.

Risk Communication Training Topics: Event Phases

More than half of the 170[34] trainings specifying content area (55.3%; *n* = 94) covered risk communication needs by event phase (see Table 5 below). However, only 15.3% covered all event phases: preparedness, response, and recovery.

Table 5: Risk Communication Training by Event Phase

Specified Event Phase	Total (*n*=170)	Percentage out of all trainings
Preparedness only	27	15.9%
Preparedness, Response, & Recovery	26	15.3%
Preparedness & Response	25	14.7%
Response only	15	8.8%
Preparedness & Recovery	1	0.6%
Recovery only	0	0%
Response & Recovery	0	0%

In comparison, 72.9% of survey respondents indicated that their organizations communicate about risks across all phases. To break this down further, 95% reported that their organizations communicate preparedness messages; 88.6% reported they communicate response/warning messages; and 77.7% reported they communicate recovery messages annually. Table 6 presents more detailed results.

Table 6: Survey Respondents' Organizations' Risk Communication Frequency by Event Phase

Risk Communication Dissemination Frequency	Total	Percentage
Preparedness Phase (*n* = 140)		
1-4 times per year	43	30.7%
5-10 times per year	24	17.1%
10+ times per year	66	47.1%
N/A	7	5.0%
Response/Warning Phase (*n* = 140)		
1-4 times per year	43	30.7%
5-10 times per year	24	17.1%
10+ times per year	57	40.7%
N/A	16	11.4%
Recovery Phase (*n* = 139)[35]		
1-4 times per year	56	40.3%

[34] Three of the private sector trainings were based on client needs and did not include information on content areas. Therefore, for all content area categories the sample size is 170.
[35] One participant did not answer regarding his or her organization's risk communication frequency during the recovery phase.

5-10 times per year	20	14.4%
10+ times per year	32	23.0%
N/A	31	22.3%

Risk Communication Training Topics: Event Types

The overwhelming majority of survey respondents indicated that their organizations communicate risks related to natural hazards (see Table 7 below). The fewest respondents indicated that they communicate about suspected- or declared-terrorist attacks. On average, participants reported their organizations communicate information about approximately six (Mean (*M*) = 6.1, *SD* = 3.6*)* different hazards each, as explained further in Table 7.

Table 7: Survey Respondents' Organizations' Risk Communication by Event Type

Event Type	Total (*n* = 140)	Percentage
Winter storm	111	79.3%
Flood	95	67.9%
Heat wave	91	65.0%
Tornado	84	60.0%
Hurricane/tropical storm	71	50.7%
Airborne infectious disease	55	39.3%
Criminal activity-general	48	34.3%
Bomb threat	39	27.9%
Explosion/fire-destruction of property	33	23.6%
Toxic material release	30	21.4%
Vector borne infectious disease	29	20.7%
Other	23	16.4%
Radiological material release	20	14.2%
Death on premises/in area	19	13.6%
Hostage event on premises/in area	19	13.6%
Large-scale environmental crisis	18	12.9%
Foodborne infectious disease	15	10.7%
Waterborne infectious disease	15	10.7%
Suspected terrorist threat-general	14	10.0%
Laboratory/industrial accident	7	5.0%
Suspected terrorist threat-biological	6	4.3%
Suspected terrorist threat-chemical	5	3.6%
Suspected terrorist threat-radiological	4	2.9%
Declared terrorist attack-general	4	2.9%
N/A	4	2.9%
Declared terrorist attack-biological	2	1.4%
Declared terrorist attack-radiological	2	1.4%
Declared terrorist attack-chemical	1	0.7%

Furthermore, the overwhelming majority of survey respondents (87.1%) reported that risk messages should differ according to hazard type. Individual respondents elaborated that "every event is unique, and too much standardization in messaging loses credibility" and "there is no 'one-size-fits-all' messages for risks." Individual respondents who indicated that messages do not need to vary by hazard type stated that "the principles of effective communication are the same regardless of the subject" and "all messages should be based on an all-hazards approach." Some respondents also asserted that tailoring messages to hazard types could potentially lessen the public's response to more routine risks, such as crime.

While 87.1% reported that messages should be hazard-specific, only 38.3% of trainings focused on specific hazards. Across the 170 trainings analyzed for content, public health risks were the most frequently covered hazard types, followed by terrorism, environmental hazards, and natural disasters (see Table 8 below). Further, 25.9% of trainings concentrated on unintentional acts, such as natural disasters, technical breakdowns, and influenza outbreaks, and 12.4% focused on intentional acts, such as chemical, biological, nuclear, and radiological terrorism, as well as purposeful adulteration of the food supply.

Table 8: Presence of Hazard-Specific Information in Risk Communication Trainings

Hazards	Total (*n* = 170)	Percentage
Public health hazards: Non-terrorism	33	19.4%
Terrorism	21	12.4%
Environmental hazards	8	4.7%
Natural disasters	3	1.8%

Risk Communication Training Topics: Communication Channels

Survey respondents most frequently indicated that their organizations use organizational channels to communicate risks, including email (81.4%) and their websites (77.9%). Respondents frequently reported that their organizations conduct media outreach through press releases (62.1%) but least often reported that they use public transportation advertising or blogs (see Table 9 below). For "other" responses, participants described their organizations communicating risk through newspaper and magazine columns, employee newsletters, conferences, live media interviews, and radio.

Table 9: Survey Respondents' Organizations' Use of Risk Communication Channels

Channel Type	Total (*n* = 140)	Percentage
Email	114	81.4%
Organization website	109	77.9%
Press releases	87	62.1%
Text messages	79	56.4%
Public meeting	66	47.1%
Facebook	63	45%
Emergency Alert System	62	44.3%
Public Service Announcement	57	40.7%

Information kiosks/brochures/ Pamphlets	50	35.7%
Reverse 911	43	30.7%
Twitter	41	29.3%
Webinars/online presentations	35	25%
Online courses	33	23.6%
Other	30	21.4%
Opt-in alerting system	29	20.7%
Door-to-door campaigns	19	13.6%
Outdoor advertising (e.g., billboards)	12	8.6%
Blogs	11	7.9%
Public transportation advertising	4	2.9%

Note: Respondents were able to select multiple channels.

A majority of the 170 trainings analyzed for content (72.4%) covered how to directly communicate risks to the public, including how to develop effective messages and messaging strategies. Only 6.5%, however, covered instruction on using social media. Similarly, only 1.2% covered social media relations, which includes information on topics such as building relationships with social media content creators. A larger percentage (40.1%) covered traditional media relations such as spokesperson training and pitching news stories to the media. Open-ended survey responses highlighted the need for training on how to use social media effectively, particularly during the preparedness phase. One respondent wrote, "I need more in social media. [I] understand some of it, but it is key to future risk communications." Survey respondents also requested more "real-life success stories" and examples of effective social media use across event phases.

Risk Communication Training Topics: Audiences

Of the 170 trainings analyzed for content, only a small fraction covered reaching special needs populations[36] (5.3%) or developing cultural awareness of targeted audiences (7.1%). This finding is notable given that survey respondents reported that their organizations had comparatively low capacities to handle special needs populations (although responses to these questions depended on the type of special needs population). Respondents ranked illegal immigrant populations (M = 2.6, SD = 1.1), activists and/or militant populations (M = 2.6, SD = 1.2), and transient populations (M = 2.6, SD = 1.2) as the groups with whom their organizations are least prepared to communicate.[37] Respondents expressed

[36] No set definition of special needs populations exists. Sorensen (2006) defined those with special needs as having "any number of characteristics—medical, cultural, cognitive, racial, physical, or a combination thereof—that sets them apart from other individuals in terms of needs" (p. 3). However, we expanded upon Sorensen's (2006) definition by including those with low income, low literacy rates, low English fluency rates, and/or mental health issues, immigrants, transient, tribal, and/or elderly populations, those who are sensory-disabled, chronically ill, developmentally disabled, geographically isolated, and/or incarcerated, children, and/or activists/militants. This expanded list was informed by our risk communication research literature review, which included research on special needs populations (Janoske, Liu, & Sheppard, 2012).

[37] Participants rated items on a scale from 1 (weak) to 5 (strong).

the most confidence in their organizations' capacities to communicate with elderly populations (M = 3.4, SD = 1.1) and with low income populations (M = 3.3, SD = 1.1). Overall, respondents indicated a relative lack of confidence in their organizations' capacities to communicate with special needs populations and/or diverse groups.

In addition, open-ended survey responses about priorities for future risk communication trainings included requests for more trainings focused on interacting and engaging with diverse audiences. Specific types of audiences mentioned by respondents were: militant/activist groups, special needs populations, elected officials, school-aged audiences, media, campus populations, rural communities, and international audiences. One respondent wrote that special needs populations were important to better understand because they are a "small part of the overall population, [but a] large part of the communications needs." Survey respondents also expressed interest in more trainings focused on the cultural and religious diversity of their communities and how to better communicate in cross-cultural contexts.

The training analysis revealed that only 20.2% of risk communication trainings target community-based audiences, compared to 57.1% that target government audiences. However, survey respondents largely ranked their organizations' capacities to engage local leaders and local expertise as above average. On average, respondents also indicated confidence in their organizations' abilities to: identify "leaders and/or messengers that resonate with local communities" (M = 3.8, SD = 1.0)[38] and align "community expectations with the expectations of authority figures" (M = 3.5, SD = 1.1).

Risk Communication Training Topics: Evaluation

Only 27.1% of survey respondents reported attending training that covered evaluating risk communication, and only 25.9% of trainings analyzed for content covered evaluation (n = 44). Evaluation methods covered in the analyzed trainings included formal audience needs assessments, such as surveys, interviews, and focus groups; informal community outreach, after-action reports, and developing measures of success.

Risk Communication Training Evaluation and Achievement Milestones

In addition to analyzing evaluation content, we reviewed existing trainings to determine if they reported learning objectives assessments. Of the 95 trainings for which information was available, only 38.9% reported learning outcome assessment methods or results. The most prevalent evaluation method was a post-test completed after trainings, present in 26 of the trainings (27.4%) as a stand-alone evaluation method or in conjunction with a pre-test and/or quiz. Table 10, below, displays the other learning outcome evaluation methods used across trainings.

[38] Again, participants rated items on a scale from 1 (weak) to 5 (strong).

Table 10: Learning Outcome Evaluation Methods Used in Risk Communication Trainings

Learning Outcome Evaluation[39]	Total (*n* = 95)[40]	Percentage
None	58	61.1%
Pre-test & post-test	12	12.6%
Post-test	10	10.5%
Quiz	5	5.3%
Subjective, non-test final assignment	5	5.3%
Pre-test, post-test, & quiz	2	2.1%
Post-test & quiz	2	2.1%
Peer evaluation	1	1.1%
Pre-test	0	0%

The majority of the analyzed trainings (55%) did not provide a certificate or credits awarded upon successful completion of the trainings. For those that specified a milestone of achievement, a completion certificate was most common (provided by 17%).

Table 11: Risk Communication Trainings' Achievement Milestones

Achievement Milestone	Total (*n*=100[41])	Percentage
None	55	55%
Completion certificate	17	17%
Continuing education unit & completion certificate	8	8%
Continuing education unit	6	6%
Continuing education unit &	5	5%

[39] Each combination of learning outcome evaluations was coded separately to assess the extent to which multiple learning outcome evaluations were used within each training.
[40] 78 of the trainings did not specify what, if any, learning outcome evaluation methods were used. Because of the coding ambiguity this presented, these trainings were excluded from this analysis.
[41] 73 of the trainings did not specify what, if any, achievement milestones existed. Because of the coding ambiguity this presented, these trainings were excluded from this analysis.

contact hours		
Course credit	4	4%
Continuing education unit, completion certificate, & contact hours	4	4%
Contact hours	1	1%

Recommendations For Future Risk Communication Training

Based on these findings, we generated the following recommendations for developing effective risk communication training to meet current needs.

Delivery Mechanisms

The survey and training analysis results suggest that **risk communication trainings would benefit from increased diversity in delivery mechanisms**.

- **More blended learning**: Only one of the 173 analyzed trainings was delivered in a blended learning format. Yet, substantial evidence indicates that blended formats improve learning outcomes compared to a solely face-to-face or online format (e.g., Ge, 2012; Lim, Morris, & Kupritz, 2007; Means et al., 2010). Survey respondents also largely called for risk communication trainings that combine on- and offline delivery methods.

  These calls for blended learning initiatives, however, must be understood within the context of other important survey findings. Specifically, survey respondents most frequently attended online trainings and webinars and least frequently attended one-day and multi-day training courses. These findings may indicate that **in-person portions of blended trainings need to be short** (e.g., no longer than two days). Findings from this study also suggested that in-person portions of blended learning trainings could perhaps be better **tailored to their communities' unique risk communication needs** and that online portions could include more **"take-away" documents** such as risk communication plans and toolkits. Respondents largely agreed that both online and offline portions could include more samples of **"real-world" risk communication**. Survey findings also showed that in-person lectures are by far the most prevalent training technique. Future training can begin to incorporate diverse training techniques to address a broader range of learning styles.

- **Extended training pace**: Analysis of existing risk communication trainings revealed that among those offered online, 86% are asynchronous, meaning that participants can complete training components on their own time rather than being online at specific times. Survey respondents, however, recommended that online trainings span extended time periods rather than allowing participants to complete them in a single session. One method for engaging training participants over longer periods of time could be to **require participants to submit subjective, non-test assignments for instructors' feedback at the end of different segments**. None of the analyzed trainings required participants to submit these types of assignments for feedback.

- **Tiered options**: Survey respondents recommended a tiered system to accommodate training participants' varied risk communication expertise. Similarly, survey respondents recommended full courses and shorter, refresher courses. These findings indicate that **ideal trainings could be flexible** so that trainers and/or participants could remove portions based on participants' risk communication backgrounds. For example, intensive training on how to effectively engage with journalists would be useful for those with no media relations background, but less useful for seasoned public information officers.

- **Training community-based audiences**: **Methods for working with community partners to better circulate risk information was a stated priority for survey respondents, but an under-developed topic in current training materials**. The training analysis revealed that only 20.2% of risk communication trainings target community-based audiences, compared to 57.1% that target government audiences.

Risk Communication Training Topics

The survey and training analysis results suggest that **risk communication training topics could be improved as follows**:

- **More trainings that cover all event phases**: Only 15.3% of the evaluated trainings covered all event phases: preparedness, response, and recovery. In comparison, the majority of survey respondents indicated that their organizations communicate about risks across all phases: 95% reported that their organizations communicate preparedness messages, 88.6% reported they communicate response/warning messages, and 77.7% reported they communicate recovery messages annually. Risk communication is most effective when it takes a life cycle approach and adequately prepares the public for future risks, helps them respond when risks become crises, and helps them recover after adverse events (Janoske et al., 2012).

- **More hazard-specific trainings**: The overwhelming majority of survey respondents (87.1%) reported that risk messages should differ according to hazard type. Conversely, only 38.3% of trainings focused on specific hazards. The survey indicated that the overwhelming majority of respondents' organizations' risk communication responsibilities are related to natural hazards, but across the analyzed trainings, public health risks were the most frequently covered hazard types, followed by terrorism, environmental risks, and natural disasters.[42] Future risk communication trainings could be tailored so that they cover hazards specific to their participants' communities, as well as general risk communication principles that apply to all hazards (e.g., accuracy, timeliness, credibility).

- **More social media training**: Survey responses highlighted the need for training on how to use social media effectively, particularly during the preparedness phase, despite the fact that 45% reported attending risk communication training on social media use in the past three years. Survey respondents also requested more "real-life success stories" and examples of effective social media use across event phases. However, only 6.5% of the analyzed trainings included instruction

[42] It is possible that a specific focus on natural disasters was not present in the analyzed trainings because trainers and trainees see natural hazards as common and not part of a special threat, such as terrorism. They may consider natural disasters to be part of the all-hazards approach.

on using social media to reach the public directly and only 1.2% covered developing relationships with social media creators more generally despite a growing body of research on the subject (Janoske et al., 2012). For example, research shows that during disasters the public uses social media to fill in information gaps, and in many cases social media are the first places the public turns for disaster information (Fraustino, Liu, & Jin, 2012). Consequently, social media training should be an essential component of risk communication education.

- **More special needs populations trainings**: Only a small fraction of the analyzed trainings covered reaching special needs populations (5.3%) and developing cultural awareness of targeted audiences (7.1%). This finding is notable given that survey respondents reported that their organizations had comparatively low capacities to handle special needs populations, although responses to these questions depended on the type of special needs population. Communicating effectively demands that communicators have knowledge about their diverse audiences (Samovar, Porter, & McDaniel, 2006). In addition, survey respondents expressed an interest in more trainings focused on working with their communities' culturally and religiously diverse populations.

- **More evaluation training**: Only 27.1% of survey respondents reported attending training that covered evaluating risk communication. Also, only 25.9% of analyzed trainings taught learners to develop performance assessment measures or discussed the need to evaluate risk communication plans and performance.

Evaluation and Achievement Milestones

The **training analysis indicated that few courses evaluated learning outcomes and there may be an unfilled need for programs offering achievement milestones for completing risk communication training**.

- **More evaluation of learning outcomes:** Of the 95 trainings for which information was available, only 38.9% specifically referenced learning outcome assessment. The most prevalent evaluation method for all analyzed trainings was a post-test completed after trainings, present in 26 of the trainings (27.4%) as a stand-alone evaluation method or in conjunction with a pre-test and/or quiz. Only 2.1% of the analyzed trainings, however, included a pre-test and/or interim quiz alongside a post-test. As a result, most of the programs utilizing post-test assessment lacked an analysis of trainees' baseline knowledge, rendering their assessments incomplete. These findings are notable given the emphasis that instructional design methods place on assessment (Dick, Carey, & Carey, 2001; Morrison, Ross, & Kemp, 2004; Rothwell & Kazanas, 2008). Future trainings should include pre-tests to assess trainees' baseline knowledge, quizzes and interim learning assessments to identify any learning gaps occurring during the training, and post-tests to assess changes in knowledge acquisition.

- **More achievement milestones**: The majority of the analyzed trainings (55%) did not provide a certificate or credits awarded upon successful completion of the trainings. For those that specified a milestone of achievement, a completion certificate was most common (provided by 17%). Existing research is lacking on the potential positive outcomes of offering achievement milestones—the survey did not ask respondents whether achievement milestones would increase their likelihood of attending and/or completing trainings or other potential positive outcomes (e.g., career advancement, learning retention); and training research is notably silent on this topic.

Thus, future research should explore potential positive outcomes of offering achievement milestones.

Conclusion

Many trainings fail because they do not adequately address participants' training needs (Carnevale, Gainer, & Villet, 1990; Montesino, 2002). This report lays the foundation for developing trainings based on risk communicators' stated needs, which include training on:

- **All event phases**;
- **Audience analysis**;
- **Media relations including social and traditional media**;
- **Risk communication planning**; and
- **Performance evaluation.**

Approaching learning as a process produces effective training. Kolb's (1984) experiential learning framework and subsequent research in the last three decades illustrate the benefits of attention to developing training that meets multiple learning styles such as through:

- **Blended learning formats**;
- **Interactive activities such as crisis simulations**;
- **Case study teaching methods**;
- **Exercises to develop working templates and strategy documents for post-training use**; and
- **Opportunities to train community-based audiences together**.

START will incorporate this report's findings into developing new, scientifically rigorous risk communication training. In addition, START recommends selecting training participants based on geographical communities. As experts note, when risks manifest into crises multiple organizations must collaborate with the public to mitigate harm (Covello & Sandman, 2005; Heath, 2010). Yet, current trainings are often delivered to members of single organizations or unconnected individuals. Consequently, START's risk communication trainings will not only cover content and delivery method gaps identified in this report, but also strengthen the community-based relationships necessary for an effective crisis response.

Appendix A: Training Producers Represented in Inventory

Federal government agencies

Agency for Toxic Substances & Disease Registry
Argonne National Laboratory
Centers for Disease Control and Prevention
Defense Threat Reduction Agency
Department of Health and Human Services
Department of Homeland Security
Environmental Protection Agency
Federal Bureau of Investigation
Food and Drug Administration
Federal Emergency Management Agency
National Institute of Standards and Technology
National Oceanic and Atmospheric Administration
National Strike Force U.S. Coast Guard
Naval Civil Engineer Corps Officers School
Navy & Marine Corps Public Health Center
Oak Ridge Institute for Science and Education
U.S. Army Public Health Command
U.S. Joint Forces Command
U.S. Nuclear Regulatory Commissions
U.S. Agency for International Development

State and local governments

California Governor's Office of Emergency Services
Clark County Public Health (WA)
DelValle Institute for Emergency Preparedness (Boston)
Kansas Department of Health
Michigan Department of Community Health Office of Public Health Preparedness
Missouri Department of Health and Senior Services
San Mateo County Health Department (CA)
Santa Clara County Public Health Department (CA)
Seattle & King County Public Health (WA)
The Metropolitan Washington Council of Governments
Ware County Board of Health

University-affiliated programs

Arizona State University
Ball State University
Center for Infrastructure Protection and Homeland Security (George Mason University School of Law)
Center for Public Health Practice (The Ohio State University)

Center for Excellence for Emergency Preparedness Education and Training (University of Massachusetts Medical School)
Center for International Security and Cooperation (Stanford University)
Columbia Regional Learning Center (Columbia University)
Columbia University Mailman School of Public Health
Early Responders Distance Learning Center (St. Joseph's University)
Harvard School of Public Health
Heartland Centers for Public Health & Community Capacity Development (St. Louis University)
Johns Hopkins Bloomberg School of Public Health
Joint Institute for Food Safety and Applied Nutrition (University of Maryland)
K-State Research and Extension (Kansas State University)
MidAmerica Center for Public Health Practice (University of Illinois at Chicago)
Morgan State University School of Community Health and Policy
National Center for Food Protection and Defense (University of Minnesota)
National Center for Foreign Animal and Zoonotic Disease Defense (Texas A&M University)
National Disaster Preparedness Training Center (University of Hawaii)
NORC Walsh Center for Rural Health Analysis (University of Chicago)
Northwest Center for Public Health Practice (University of Washington)
Penn State Cooperative Extension
School of Public Health and Health Services (George Washington University)
School of Public Health (University of Albany)
South Central Public Health Partnership (University of Alabama at Birmingham and Tulane University)
Texas A&M School of Rural Public Health
The Southern Center for Communication, Health, & Poverty (University of Georgia)
University of North Carolina Gillings School of Global Public Health
University of Texas Health Science Center at Houston School of Public Health
University of Central Florida Nicholson School of Communication
University of Michigan Risk Science Center
University of Michigan School of Public Health
University of Minnesota Center for Public Health Preparedness
University of Minnesota School of Public Health
University of Pittsburgh Graduate School of Public Health
Upper Midwest Preparedness and Emergency Response Learning Center (University of Iowa)
Western Institute for Food Safety and Security (University of California-Davis)

Private sector organizations

Advanced Learning Institute
Booz Allen Hamilton
C4CS
Casey Hall Training Associates
Center for Excellence for Risk and Crisis Communications
Center for Risk Communication
Center for Toxicology and Environmental Health
Centre for Excellence in Communications
dida connor
Diogenec Group
Focus Group

IEc
Intertox
McDaniel Lambert
Mpact Communication
Parker Horn Company
PIER Systems
Potomac Communications
Ropeik & Associates
The Institute of Risk Management
The Shipley Group
The Vandiver Group
Wiltshire Consulting

Nonprofit organizations

American Industrial Hygiene Association
American Public Health Association
Association of State and Territorial Health Officials
Center for National Policy
Collaborating Agencies Responding to Disasters
Community Emergency Preparedness Information Network (CEPIN)
Community Nonprofit Resource Group
Health Research Educational Trust of New Jersey
Mid-America Regional Council
National Academy of Engineering
National Association of Government Communicators
National Education Association
National Research Council of the National Academies
New England Alliance for Public Health Workforce Development
Postsecondary Education Programs Network
Public Affairs Council
Society for Risk Analysis
Southeast Wisconsin Homeland Security Partnership, Inc.

Foreign government/international organizations
Asian Disaster Preparedness Center
Asia-Pacific Economic Cooperation
Australian Remediation Industry Cluster
International Association for Public Participation
International Atomic Energy Agency
National Collaborating Centre for Environmental Health
Ontario Agency for Health Protection and Promotion
Organisation for Economic Co-Operation and Development
Pan American Health Organization
Republic of the Philippines Department of Health
World Bank Institute
World Health Organization
World Meteorological Organization

Appendix B: Risk Communication Training Analysis Coding Protocol

Effective Risk Communication Training Analysis Coding Protocol

Instructions: Use the following protocol to code each of the 173 trainings in the Effective Risk Communication Training Inventory. Capture the coding in an Excel file using "1" to indicate that the code is present in a training and "0" to indicate that a code is absent in a training. The unit of analysis is each training.

Code	Description
Training Format: Achievement Milestones	
Completion certificate	Trainee receives a document for successful completion of training.
Contact hours	Training lists contact hours, which indicate how much scheduled instruction students receive.
Continuing education unit	Trainee receives one or more Continuing Education Units (CEUs), which are a nationally recognized method of quantifying time spent in the classroom during professional development and training activities. Ten hours of instruction = 1.0 CEU. One hour of instruction = 0.1 CEU.
Course credit	Trainee fulfills a university or college requirement at an institution for completion of the training.
None	The training does not include an achievement milestone.
Training Format: Learning Outcome Evaluation	
Final assignment	Trainee completes a final assignment to be evaluated by the trainer, such as a risk communication plan or a final presentation.
None	Training does not have a learning outcome evaluation.
Peer evaluation	Trainees provide verbal or written feedback to each other.
Post-test	Trainees take a test at the end of training to assess their learning.
Pre-test	Trainees complete a test prior to the training to establish their baseline knowledge.
Quiz	Trainees take quizzes that assess knowledge acquisition throughout the training. Quizzes may occur between pre-test and post-tests (if present) or independent of other testing.
Training Producer Type	
Federal government	Federal government agency produced the training.
Foreign government/international organization	Foreign government and/or international organization produced the training.
Nonprofit organization	Nonprofit organization produced the training. Nonprofit organizations are defined as organizations that meet the IRS requirements for 501(c)(3) or 501(c)(4) status.
Private sector	Private company produced the training.
State/local government	State/local government agency produced the training.

University-affiliated program	University-affiliated program produced the training. Also includes research centers in which the training is offered through university-affiliated programs. Programs funded by or connected to a federal agency but administered by university should be coded as produced by a university-affiliated program.
Training Audiences	
Academic/Scientific	Training targets an academic and/or scientific community, such as researchers, subject matter experts, and scientists.
Community-based	Training targets community-based audiences, such as community and civic leaders; organizations representing special needs populations; faith-based organizations; non-profit organizations; school/campus community representatives; and interpreters.
Government	Training targets those working for government at the local, state, regional, or national level. This includes public information officers (PIOs) and public affairs officers (PAOs); elected and appointed officials; government food safety professionals; military professionals; and emergency management professionals.
Public health	Training targets audiences in the public health field. This includes public health departments, public health practitioners, and programs that emphasize public health concepts, ideals, and responsibilities (including community health, disease prevention and containment, etc.).
Health care providers	Trainings targets doctors, nurses, first responders, and other professionals providing direct medical care.
Media professionals	Training targets media professions such as print and broadcast journalists.
Trainers	Training targets professional trainer audiences.
Training Delivery Formats	
In-person	Trainers and trainees are in the same place at the same time.
Online/webinars	Training is delivered via the Internet.
Reference materials	Training is delivered solely through written materials such as a workbook, study guide, or training manual.
Case studies	Training uses documented events or cases to provide historically based understanding of risk or crisis communication.
Discussion/panels	Training includes trainer-led discussion with trainees participating in person.
Lecture	Training includes a lecture delivered by trainer to teach concepts to trainees.
Simulation/exercises/ Scenarios	Training includes activities that require participants to think about and/or respond to a situation and practice learned skills.
Videos	Training includes trainees watching one or more videos.
Worksheets/templates/ manuals/handouts	Training incorporates worksheets, templates, manuals, handouts, or other take-away materials from trainings.
Training Topics	
Audiences : General	Training identifies risk communication needs focused on general (rather

	than specific) audiences.
Audiences: Cultural awareness	Training explains influential cultural factors that may affect audiences' risk communication needs.
Audiences: Special needs populations	Training identifies special needs populations' risk communication needs. Special needs populations include those with low income, low literacy, low English fluency rates, and/or mental health issues, immigrants, transient, tribal, and/or elderly populations, those who are sensory-disabled, children, chronically ill, developmentally disabled, geographically isolated, and/or incarcerated, children, and/or activists/militants.
Communication channels: Direct-to-the-public communication	Training explains strategies and tactics for communicating risk directly to the public (rather than through journalists and social media content creators).
Communication channels: Social media relations	Training focuses on developing relationships with social media creators and bloggers.
Communication channels: Traditional media relations	Training identifies how to effectively work with journalists as partners for disseminating risk communication to the public.
Evaluation	Training teaches trainees how to assess the effectiveness of risk communication.
Event Phase: Preparedness	Training focuses on communication actions taken prior to a crisis including planning and/ or other preparatory actions.
Event Phase: Response	Training focuses on communication action taken during a crisis. This also includes warnings and Joint Incident Command (JIC)/National Incident Management System (NIMS).
Event Phase: Recovery	Training focuses on communication actions taken when a crisis is declining or resolved.
Specific Hazard: Environmental hazards	Training focuses on environmental hazards, which include non-terrorist and non-natural disaster threats, such as unintentional contamination of drinking water through chemical runoff.
Specific Hazard: Natural hazards	Training focuses on natural hazards, which include weather-related threats, geological-related threats (such as earthquakes), and wildfires (from natural causes).
Specific Hazard: Public health hazards: Non-terrorism	Training focuses on public health hazards, which include unintentional threats that could potentially impact large groups of people, such as pandemic flu and other health epidemics. Unintentional threats to food safety, such as an E. coli outbreak, are also included.
Specific Hazard: Terrorism	Training focuses on terrorism including chemical, biological, radiological, nuclear, or small arms or explosives (CBRNE) terrorism. This category also includes intentional threats to food safety.

Appendix C: Risk Communicator Needs Assessment Survey

Thank you for taking the time to complete a needs-assessment survey of risk communication and community engagement professionals. Researchers at the University of Maryland's National Consortium for the Study of Terrorism and Responses to Terrorism (START) have crafted this survey as part of a project to develop new and cutting-edge training materials incorporating both scholarly research and best practices.

This online survey will take approximately 30 minutes to complete. START researchers will use your responses in the development of training curricula, and both START researchers and Department of Homeland Security personnel may review your responses. To protect your anonymity, the survey will not collect your name, email address, or Internet (IP) address, and your responses will not link to demographic information about you.

The Human Factors/Behavioral Sciences Division[43] of the Department of Homeland Security's Science and Technology Directorate has provided the funds for this project, via contract number HSHQDC-10-A-BOA36.

The University of Maryland's Institutional Review Board has approved this survey according to their protocol for ethics in human-subjects research.

If you have questions about the survey and/or larger project, please contact Stephanie Madden at smadden@umd.edu.

To complete the survey, please click the "Continue to Survey" button below.

1 – What is your current job title?

(short-form box)

2 – How would you characterize the mission of your organization? Please check all that apply.

___ Emergency management

___ Public health

___ Homeland security

___ Law enforcement

___ Community-based organization

___ Faith-based organization

___ Other social-service provision

[43] After this survey was conducted, the Human Factors/Behavioral Sciences Division became part of the Resilient Systems Division.

Other: (Long-form response box)

3 – Approximately how many employees work in your organization?

[short-form box] (numbers only)

___Not applicable

4 - Approximately how many volunteers serve your organization?

[short-form box] (numbers only)

__Not applicable

5 - Do you regularly supervise employees and/or volunteers?

___ Yes

___ No

If yes, approximately how many?

[short-form box] (numbers only)

6 –How many years have you been in your current position?

(short-form box) (numbers only)

__Not applicable

7 – Within what region(s) do you primarily work? Please check all that apply.

__New England (CT, ME, MA, NH, RI, VT)

__Middle Atlantic (NJ, NY, PA)

__Midwest-East North Central (IN, IL, MI, OH, WI)

__Midwest-West North Central (IA, KS, MN, MO, NE, ND, SD)

__South Atlantic (DE, DC, FL, GA, MD, NC, SC, VA, WV)

__South-East South Central (AL, KY, MS, TN)

__South-West South Central (AR, LA, OK, TX)

__Mountain West (AZ, CO, ID, NM, MO, UT, NV, WY)

__Pacific Northwest (AK, CA, HI, OR, WA)

__Outside of United States

8 - Do you work with urban populations?

__ Yes

___No

9 - Do you work with suburban populations?

___ Yes

___ No

10 - Do you work with rural populations?

___ Yes

___ No

11 – Approximately what percentage of your time do you spend on risk communication?

(short-form box)% (enter 0-100)

12 – How does your organization define risk communication?

(long-form box)

13 – Approximately how often does your organization deliver risk communication messages related to preparedness?

__1-4 times per year

__5-10 times per year

__10+ times per year

__N/A

14 – Approximately how often does your organization deliver risk communication messages related to emergency response and imminent warnings?

__1-4 times per year

__5-10 times per year

__10+ times per year

__N/A

15 – Approximately how often does your organization deliver risk communication messages related to recovery?

__1-4 times per year

__5-10 times per year

__10+ times per year

__N/A

16 – What types of events have led your organization to communicate risk over the past five years? Please check all that apply.

___ Hurricane/tropical storm

___ Flood

___ Tornado

___ Winter storm

___ Heat wave

___ Airborne infectious disease (e.g. pandemic influenza)

___ Foodborne infectious disease (e.g. Listeria)

___ Waterborne infectious disease (e.g. Cryptosporidiosis)

___ Vector borne infectious disease (e.g. West Nile virus)

___ Toxic material release

___ Radiological material release

___ Large-scale environmental crisis

___ Death on premises/in area

___ Hostage event on premises/in area

___ Explosion/fire-destruction of property

___ Laboratory/industrial accident

___ Bomb threat

___ Criminal activity - general

___ Suspected terrorist threat – general

___ Suspected terrorist threat – chemical

___ Suspected terrorist threat – biological

___ Suspected terrorist threat – radiological

___ Declared terrorist attack – general

___ Declared terrorist attack – chemical

___ Declared terrorist attack – biological

___ Declared terrorist attack – radiological

Other: (long-form box)

___ N/A

17 – Do you believe that risk messages must differ according to hazard (e.g., terrorist attack versus earthquake)? Why or why not?

__ Yes

__ No

Please explain [short-form box]

18—Through what channels does your organization communicate risk? Please check all that apply.

___ Organization website

___ Reverse 911

___ Emergency Alert System (EAS)

___ Webinars/online presentations

___ Online courses

___ Blog

___ Email

___ Text messages

___ Opt-in alerting system

___ Facebook

___ Twitter

___ Public meeting

___ Public service announcements

___ Door-to-door campaigns

___ Press releases

___ Information kiosks/brochures/pamphlets

___ Outdoor advertising (e.g. billboards)

___ Public transportation advertising

Other: (Long-form response box)

19 – With what types of organizations do you work in communicating risk? Please check all that apply.

___ Private sector/business/industry leaders

___ Volunteer organization representatives

___ Faith-based organization

___ Elected officials

___ News media representatives

___ Schools/other educational institutions

___ Civic organizations

___ Community centers

___ Neighborhood associations

___ Cultural organizations/clubs

___ Health centers/hospitals/clinics

___ Utility companies

___Federal government officials

___State officials

___Local/tribal officials

Other (please specify): (long-form box)

20 – How would you rate your organization's capacity to implement national plans for emergency preparedness, response, and recovery?

National plans for emergency preparedness	**1** – Weak	**2**	**3** - Avg	**4**	**5** – Strong	**N/A**
National Response Framework						
National Incident Management System						
Incident Command System						

21 - How would you rate your organization's capacity to complete the following tasks associated with crisis communication?

Pre-Crisis Phase	**1** - Weak	**2**	**3** – Avg	**4**	**5** – Strong
Developing strategic alliances with other local organizations					
Developing recommendations for effective risk communication					
Developing test messages					

Identifying and developing trust with key public audiences					
Initial Crisis Phase	**1** - Weak	**2**	**3** – Avg	**4**	**5** – Strong
Establish credibility for your organization and/or spokesperson					
Provide emergency information					
Provide accurate and timely updates					
Crisis Maintenance Phase	**1** - Weak	**2**	**3** – Avg	**4**	**5** – Strong
Track communication activities					
Help people accurately understand their risks					
Provide background information on the crisis to those who need it (e.g. media)					
Gain support for response/recovery plans by providing accurate and timely information					
Explain emergency recommendations					
Empower individuals to make their own decisions about risks/benefits					
Crisis Resolution Phase	**1** - Weak	**2**	**3** – Avg	**4**	**5** – Strong
Educating audiences to be prepared for future emergencies					
Examining problems and mishaps, reinforcing best practices					
Gaining public support for policies and resource allocation					
Reinforcing your organization's identity both externally and internally					

22 - How would you rate your organization's capacity to develop and deliver the following types of messages to external audiences?

Message Types	**1** - Weak	**2**	**3** – Avg	**4**	**5** – Strong
Persuasive – to convince the audience to accept ideas and to act in conjunction with them					
Informational – to inform or teach the audience					
Progress report – to inform or update knowledge of a familiar subject					

23 - How would you rate your organization's capacity to complete the following communication-related tasks?

Communication Tasks	**1** - Weak	**2**	**3** - Avg	**4**	**5** – Strong
Collecting and assuring accurate data on the event					
Explaining that data and its relevance to different audiences					
Explaining to audiences that similar risks have been experienced previously (i.e., risk is not new)					
Explaining how risk benefits outweigh the costs					
Creating partnerships with key audiences					

24 - How would you rate your organization's capacity to interact with the following types of organizations?

Types of Organizations	**1** - Weak	**2**	**3** - Avg	**4**	**5** – Strong
Local law enforcement organizations					
Local public health organizations					
Local EMS					
Local hospitals					
Local fire departments					
Local medical examiner					
Local social service providers					
Local general services organization					
Local media – newspaper					
Local media – television					
Local media – electronic/social					
State public health organizations					
State emergency management organizations					
State law enforcement organizations					
State EMS					
State fire service					
Federal and/or state-level National Guard					
Federal Emergency Management Agency					
United States Coast Guard					
Transportation Security Administration					
Federal Bureau of Investigation					
Centers for Disease Control					
Department of Defense					
National media –newspaper					
National media – television					
National media – electronic/social					

25 - How would you rate your organization's capacity to communicate risk in the event of different complicating factors?

Emergency Complicating Factors	**1** - Weak	**2**	**3** - Avg	**4**	**5** – Strong
Deaths are expected within a short window of time					
Deaths are expected well above normal levels					
Event is occurring in a major metropolitan area					
Event is sudden					
Event is national in scope					
Government is perceived as a cause of or responsible for the event					
Event is possibly "man-made" and/or deliberate					
Controlling the event may require a suspension of civil rights for a significant portion of the population					
A well-known product, service, or industry is involved					
Sensitive international trade or political relations are involved					
A well-respected local or national figure in the communities in which you work is involved					
An ongoing criminal investigation is involved					
Event is not well understood by the public and/or public is misinformed about the situation					
Event is evolving, i.e. its progression is uncertain and may become more or less serious					

26 - How would you rate your organization's capacity to communicate risk to special needs populations?

Special Needs Populations	**1** - Weak	**2**	**3** - Avg	**4**	**5** – Strong
Low income populations					
Populations with low literacy rates					
Populations with low English fluency rates					
Illegal immigrant populations					
New immigrant communities					
Transient populations (e.g. homeless peoples, migrant workers)					
Tribal populations					
Elderly populations					
Sensory-disabled populations (e.g. blind, deaf)					
Chronically ill populations					
Developmentally disabled populations					
Populations with mental health issues					
Geographically isolated populations					
Culturally isolated populations					
Prison populations					
Populations with high rates of young children					
Populations with high rates of pets/large animals					
Activist and/or militant populations					

27 - How would you rate your organization's capacity to engage local leaders and expertise?

Community Engagement Practices	**1** - Weak	**2**	**3** - Avg	**4**	**5** – Strong
Incorporating local/indigenous knowledge into organizational policies, plans, and procedures					
Identifying leaders and/or messengers that resonate with local communities					
Recognizing changing demographics within your community and their impacts on social vulnerability					
Facilitating peer-to-peer dialogue, information sharing, and deliberation					
Aligning community expectations with the expectations of authority figures					
Promoting community recovery and regrowth after an event					

28 – Indicate on average how many of the following risk communication specific training types you have attended annually and how many you attended last year alone. Please enter an approximate number (per year and last year).

___ Online courses [short-form box]

___ Webinars [short-form box]

___ Multi-day training course (on-site) [short-form box]

___ One-day training course (on-site) [short-form box]

___ Multi-day training course (off-site) [short-form box]

___ One-day training course (off-site) [short-form box]

___ Conference/seminar opportunities [short-form box]

___ Exercises/drills/simulations [short-form box]

Other: (long-form box)

___ N/A

29 – Indicate on average how many of the training types that included, but did not focus specifically on, risk communication that you have attended annually and how many you attended last year alone. Please enter an approximate number (per year and last year).

___ Online courses [short-form box]

___ Webinars [short-form box]

___ Multi-day training course (on-site) [short-form box]

___ One-day training course (on-site) [short-form box]

___ Multi-day training course (off-site) [short-form box]

___ One-day training course (off-site) [short-form box]

___ Conference/seminar opportunities [short-form box]

___ Exercises/drills/simulations [short-form box]

Other: (long-form box)

___ N/A

30 - Have you participated in trainings on any of the following topics in the past three years? Please check all that apply.

___Audience analysis

___Best practices

___Communication channels

___Community engagement

___Cross-cultural communication

___Evaluating your communication

___Addressing specific hazards

___National Incident Management System/Incident Command System

___ National Response Framework

___Media relations

___Developing messages

___Choosing the messenger

___Communication for mitigation

___Non-verbal communication

___Addressing obstacles/challenges to communication

___Communicating preparedness

___Relationship building

___Risk perception

___Social media

___Special populations

___Spokesperson training

___Developing a communication strategy or plan

___Theories of risk communication

___Understanding and building trust

___Public warnings

31 - Are there topics you would like to see covered in future trainings? In what types of trainings would you like to enroll?

__ Yes

__ No

If yes, what topics? (Long form response box)

32 – Is there anything you would like to add that would aid the development of new trainings on risk communication and community engagement?

__ Yes

__ No

If yes, please explain. (Long-form box)

Appendix D: Survey Respondents' Organizational Profiles

Respondents indicated that they were responsible for communicating to audiences in a wide array of U.S. states and territories and some foreign countries. The region best represented within the respondent group was the South Atlantic region, which includes Delaware, the District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, and West Virginia.[44]

Region	Total (*n*=140)	Percentage
South Atlantic (DE, DC, FL, GA, MD, NC, SC, VA, WV)	49	35.0%
Midwest-West North Central (IA, KS, MN, MO, NE, ND, SD)	24	17.1%
Middle Atlantic (NJ, NY, PA)	18	12.9%
Mountain West (AZ, CO, ID, NM, MO, UT, NV, WY)	17	12.1%
South-West South Central (AR, LA, OK, TX)	13	9.3%
Pacific Northwest (AK, CA, HI, OR, WA)	13	9.3%
New England (CT, ME, MA, NH, RI, VT)	12	8.6%
Midwest-East North Central (IN, IL, MI, OH, WI)	12	8.6%
South-East South Central (AL, KY, MS, TN)	10	7.1%
Outside of United States	8	5.7%

Although detailed information is not available, results also indicated that respondents work with all types of geographically defined audiences, including urban (76.4%), suburban (74.2%), and rural (74.2%) populations.

The majority of risk communicators surveyed (77.1%) indicated that they operate in a supervisory capacity for employees and/or volunteers, supervising an average of 54.6 people each (*SD* = 134.1, Median = 15 people). Respondents had been in their current positions an average of 7.6 years (*SD* = 6.6, Median = 5 years), with the 35 years as the longest length of time. On average, respondents reported that they spend 22.2% (*SD* = 23.9, Median = 13.5%) of their time on risk communication activities.[45]

[44] Given that our survey did not have a representative sample, this finding is most likely the result of our convenience sampling, which focused largely on the National Capital Region.
[45] This question allowed participants to think about risk communication in whatever way they wished versus providing a list of risk communication activities from which they could choose.

Appendix E: Survey Respondents' Characterizations of their Organizations' Missions

The survey asked participants to check multiple options from a series of descriptions that might apply to the type of organization in which they work. The most common option selected was "emergency management," with 48.6% of participants indicating that it was part of their organizations' mission. Participants could select "other" if they felt their organization's mission was not represented by any of the available options; 33.6% of participants selection this option. Those who selected "other" indicated that their organizations' mission included education/training (12); government (local, state, federal, tribal) (10); private sector, such as utility companies (9); non-law enforcement public safety, such as fire and rescue (9); association (2); military (2); city planning (1); hospital (1); and zoo (1). The median number of employees at the organizations in which the risk communicators worked was 64 people (M = 720, SD = 1,812.4).[46] The median number of volunteers for the organizations in which the risk communicators worked was 50 people (M = 310.1, SD = 1,071.8).[47]

Mission of organization	Total (n=140)	Percentage of total
Emergency management	68	48.6%
Other	47	33.6%
Public health	25	17.9%
Homeland security	22	15.7%
Law enforcement	18	12.9%
Community-based organization	13	9.3%
Faith-based organization	3	2.1%
Other social-service provision	3	2.1%

[46] Given the wide range of organizational sizes surveyed (the range was from 0 to 15000 employees), median was determined to be the most representative statistic of average.
[47] Median was again determined to be the most representative statistic for number of volunteers as the range was from 0 to 9000.

Appendix F: State of Risk Communication Training Programs by Geographic Region

We conducted inferential statistical analyses to provide further insights into the current state of training programs by geographic region; however, these results need to be interpreted cautiously as disaggregating the data via region yielded some regions with very small sample sizes.[48] In addition, the findings cannot be generalized to all risk communicators given the study's snow ball, convenience, and purposive sampling approaches.

While most of these tests did not show a significant difference among respondents serving in different regions, we found some notable differences:

- On average, the South-West South Central region (including AR, LA, OK, and TX) reported higher competency scores for their capacity to interact with federal organizations such as the United States Coast Guard (M = 3.7, SD = 0.8) and Department of Defense (M = 4.6, SD = 0.8).[49] Further, organizations that addressed the South-East South Central region (including AL, KY, MS, and TN) reported the lowest competency scores for interacting with the United States Coast Guard (M = 2.1, SD = 1.1) and the Department of Defense (M = 2.0, SD = 1.2).[50]

- Overall, respondents serving the Midwest-West North Central (including IA, KS, MN, MO, NE, ND, and SD) and the South Atlantic regions (including DE, DC, FL, GA, MD, NC, SC, VA, and WV) reported using non-traditional channels more to communicate risk when compared to other regions. Specifically, these regions used more webinars, online courses, text messaging, and Twitter when compared to other regions.[51] Some regions, such as the South-West South Central, were consistently low in the use of these alternative channels.

- Finally, risk communicators representing the South Atlantic region reported attending more training programs on the following topics than practitioners from other regions: Choosing the messenger, addressing obstacles/challenges to communication, and addressing special populations.

[48] For the Chi-square test, the small sample sizes met the general rule of thumb of n ≥ 5 participants for most cells (Healey, 2012). For the ANOVA, unequal sample sizes are problematic because they could be associated with unequal variances which violate one of the assumptions underlying the test. The Levene's test however confirmed that the variances were not significantly different between the cells.
[49] Participants rated items on a scale from 1 (weak) to 5 (strong).
[50] Analysis of variance results: Coast Guard: $F(10, 118) = 2.68$, $p < .01$; Department of Defense: $F(10,119) = 2.44$, $p < .05$.
[51] Chi Square test results: Webinars: $\chi^2(10, N = 35) = 22.60$, $p < .05$; Online courses: $\chi^2(10, N = 33) = 22.22$, $p < .05$; Text messaging $\chi^2(10, N = 79) = 19.87$, $p < .05$; Twitter: $\chi^2(10, N = 41) = 21.25$, $p < .05$; Choosing the messenger: $\chi^2(10, N = 23) = 19.23$, $p < .05$, Addressing obstacles: $\chi^2(10, N = 39) = 24.55$, $p < .01$, and Addressing special populations: $\chi^2(10, N = 61) = 19.52$, $p < .05$.

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