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Being prepared with accurate, credible, and timely information during a disaster can help individuals make informed decisions about taking appropriate actions. Unfortunately, many people have difficulty understanding health and risk-related resources. This exploratory, mixed methods study assessed disaster information-seeking behaviors and comprehension of public health disaster preparedness resources by individuals at an adult literacy center. A convenience pilot sample of 20 adult learners (mean age: 53.1) was recruited. Health literacy was assessed using Newest Vital Sign (NVS) and modified Cloze (multiple choice) tests on biological terrorism and avian influenza information. In-person interviews were conducted to determine participants' knowledge, perceptions, and information needs about disasters. Thematic analysis of interviews was conducted using NVivo7. Mean NVS was 3.11/6.00 implying limited health literacy. Mean Cloze scores revealed marginal disaster comprehension (avian flu: .46/1.00; biological terrorism: .48/1.00). Over half of participants with inadequate Cloze comprehension self-rated their understanding as "good." Key themes emerging from interviews were: multiple perceptions about disasters, limited access to preparedness resources, need for visuals and plain language information, and importance of knowing where to go during a disaster. Study findings advocate for multimedia, plain language, and visual communication to influence adult learners' literacy practices and self-efficacy in interpreting instructions and acting appropriately in preparing for and responding to disasters.

Having accurate, credible, and current information can help people make informed decisions about their health. Unfortunately, many individuals have difficulty accessing, interpreting, and understanding health information. Results of the most recent National Assessment of Adult Literacy (NAAL) show that the majority of adults (53%) have only intermediate health literacy (Kutner et al.). Over 75 million adults have basic or below basic health literacy and are unable to understand critical health materials such as prescription labels or hospital consent forms. As the volume of health-related resources available to the public increases, it will be crucial for health professionals and educators to

communicate messages clearly in order to direct people to understandable and reliable information, especially during public health disasters.

Disasters are often classified as natural events (e.g., hurricanes, pandemics, asteroids) or man-made events (e.g., war and population displacement, chemical or nuclear releases, structure failure) (Posner). The terms *disaster* and *emergency* are used interchangeably by the public and a distinction between the two are not made throughout this paper. During any type of disaster, it is vital that behavioral directions are communicated clearly and in plain, non-technical language. Focus groups conducted with the general public found that people are concerned about the lack of clarity found in emergency information resources (Becker). In another recent study with Latin American immigrants, participants had difficulty defining and understanding the term "emergency" (Carter-Pokras et al.). Clear, targeted health messages help focus people's attention to the information and take action if necessary (Kreuter, Strecher, and Glassman).

In light of devastating disasters such as Hurricane Katrina and the emergence of new infectious diseases and potential pandemics, this exploratory research focuses on people's awareness of public health emergency issues and suggests appropriate communication strategies for reaching diverse populations with disaster information. It is important to study people's literacy, comprehension, and perceptions of public health disasters outside of emergency conditions so they are able to consider thoughtfully and calmly the importance of disaster preparedness. Street emphasized that educators and program planners cannot assume that their definition of literacy matches the meaning of literacy held by the public. The reality of literacy practices (activities such as taking daily medications appropriately) and literacy events (behaviors such as going to the doctor) within target groups of learners must be explored carefully.

Literacy And Public Health Communication

A systems approach to public health recognizes that people's health behaviors and outcomes are impacted by more than just medical factors (e.g., health care system, physicians, medical treatment). That is, it incorporates a broader exploration of constructs that may influence health and well-being, including: social and physical environments, social support, personal coping skills, income, employment, and education (Public Health Agency of Canada, Ratzan). Literacy is also considered one of these important contributors to health. Literacy can affect health directly by influencing comprehension of important health information (e.g., prescription directions) and indirectly by affecting variables that influence health outcomes (e.g., ability to engage in a healthy lifestyle, get prescriptions filled at the pharmacy) (Rootman). While a commonly used definition of health literacy is that of the U.S. Department of Health and Human Services: "the capacity to obtain, interpret and understand basic health information and services and the competence to use such information and services to enhance health," this research is guided by a more expansive literacy framework appropriate for understanding by the public of disaster risk

information. Baker's recent conceptualization of health literacy asserts that health outcomes are determined by characteristics of both individuals and organizations, and incorporates individual capacity (individual resources for dealing with health information and resources) and organizational capacity (health system's ability to communicate about health in a comprehensible manner to consumers and patients both verbally and in writing) (Baker). A modified framework by Friedman and Tanner (Figure 1) extends Baker's conceptualization further to incorporate social and organizational/system level factors relevant to individuals' health knowledge and skills (literacy practices) and health behaviors (literacy events).
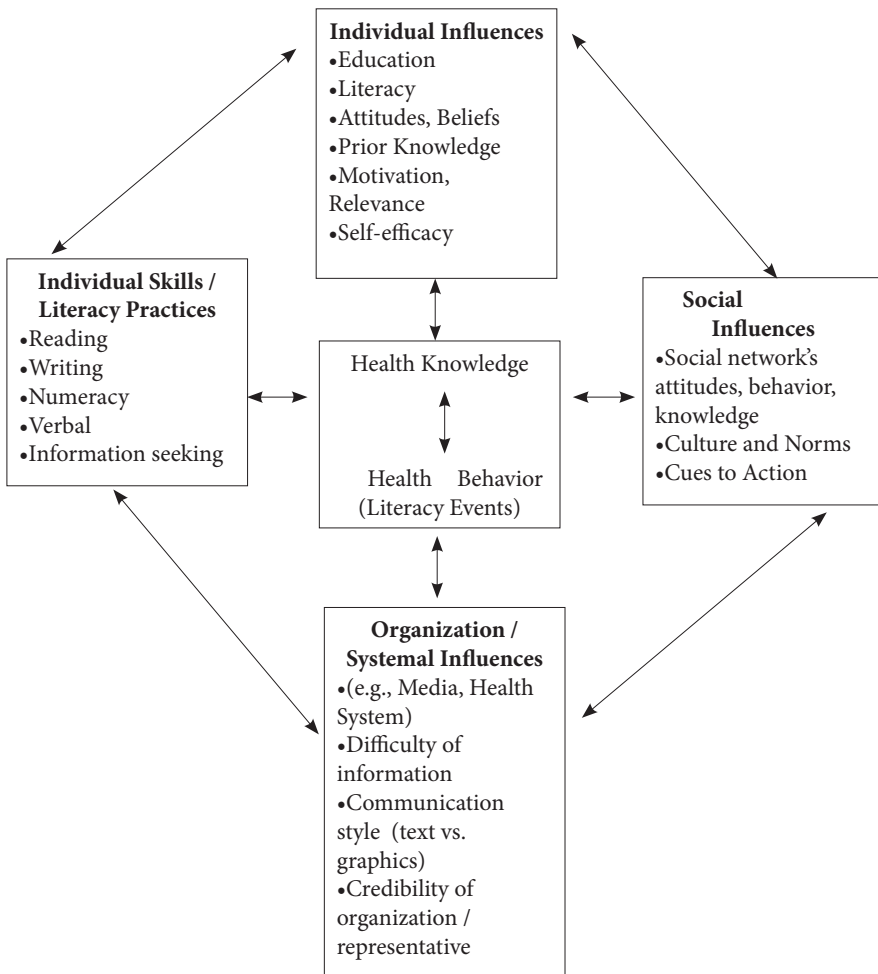

Figure 1. Social Practices Framework of Influences on Health Literacy, Knowledge, and Behavior (Modified from Friedman and Tanner)

This type of "social practices" model was originally used in workplace literacy research (Castleton; Darrah; Jackson). Similar to the original definition of health literacy that focused on individuals' ability to read and understand (medical) information (U.S. Department of Health and Human Services), the traditional view of workplace literacy stressed workers' individual skills such as reading, numeracy, and language abilities. With the emergence of the changing work place and "new work order" (Hull), individuals were then required to perform tasks more complicated than reading and writing. They were expected to communicate verbally and in writing in various new contexts and settings. Hence, this framework of multiple "literacies" as applied to health knowledge and behavior emphasizes that limited understanding of health resources is not a deficit of the individual; rather it is situated within a larger social and organizational context which must be considered during the planning and development of public health messages and educational programs. Components of the model include individual literacy practices, individual influences, social influences, and organizational influences that can affect health knowledge and/or health behavior or literacy events of individuals, groups, and society (Figure 1).

To adopt a population approach to health, it is critical that educators, mass media, and health care providers all communicate information clearly if they want people to engage appropriately in literacy events, such as taking action and modifying their behaviors and living situations in preparation for or during disasters. Findings from this exploratory research propose a number of communication strategies needed to engage individuals in preparing for and responding to public health disasters.

The Need For Literacy About Disaster Preparedness

According to the Ready.gov website, a national readiness campaign in the United States: "Emergency preparedness is no longer the sole concern of earthquake prone Californians and those who live in the part of the country known as 'Tornado Alley.' For Americans, preparedness must now account for man-made disasters as well as natural ones. Knowing what to do during an emergency is an important part of being prepared and may make all the difference when seconds count"(http://www.ready.gov/america/beinformed/index.html). Despite the need for disaster preparedness information in all regions of the United States, a recent analysis of media coverage of avian influenza in four major U.S. newspapers (*New York Times*, *Washington Post*, *Los Angeles Times*, and *Atlanta Journal-Constitution*) found little mention of symptoms or personal preparedness instructions for the public. Instructions to improve self-efficacy during emergency situations were included in less than 2% of 360 articles (Dudo, Dahlstrom, and Brossard).

Similar to the new work requirements emphasizing greater individual responsibility, Paisley states that "topical literacies [including health and science literacy] are usually discussed in terms of the public's shortcomings rather than its accomplishments," (Paisley 75). Zarcadoolas, Pleasant, and Greer

suggest multiple literacies needed to respond to and minimize the impact of a disaster (120): 1) fundamental literacy/numeracy (reading and understanding prose or numeric medical information), 2) science and technological literacy (understanding scientific uncertainty and technological complexities), 3) community/civic literacy (acquiring media literacy skills and knowledge of civic and governmental processes), and 4) cultural literacy (recognizing and using collective beliefs and customs to interpret and act on health-related information). Community and civic literacy, in particular, would be especially important during disasters to empower citizens to engage in discussions about decision-making and take necessary actions based on knowledge and understanding obtained through government, media, and organizational communications. However, studies show that the general public may have difficulty incorporating and applying knowledge about disaster risk into a coherent decision-making framework that integrates scientific knowledge (e.g., need to evacuate) with other forms of knowledge founded in cultures and traditions (e.g., not evacuating in order to keep family together) (Slaughter et al.). Results from interviews found that people's decisions to act during an epidemic involved a considerable amount of information seeking. Individuals with limited resources may not be able to conduct a comprehensive search of disaster information or understand information that they are able to access through print mass media or the Internet. A recent analysis of 50 disaster preparedness websites showed content was written in technical language and at high reading levels (Grade 10+) (Friedman, Tanwar, and Richter).

Information needs and understanding of disaster preparedness by individuals attending an adult literacy center have not yet been studied. The purpose of this exploratory study was twofold: 1) to assess adult learners' comprehension of public health disaster preparedness resources, and (2) to determine adult learners' disaster information-seeking behaviors and information needs.

Methods

Participant Recruitment

A convenience and pilot sample of 20 adult learners (aged 30 years and older) attending an urban literacy center in South Carolina were recruited. While this study involved a small pool of participants, its aim was to obtain in-depth data on a purposive sample of individuals. Recruitment was conducted by means of flyer postings, sign-up sheets, and word-of-mouth at the literacy center. South Carolina ranks 48th of all states in number of high school graduates, with only 60% of Grade 9 students completing high school in four years (National Center for Education Statistics). Average literacy scores of individuals not completing high school are below basic at 207/500 according to the NAAL (Kutner et al.).

Disaster Literacy Assessment Tools

Participants' health literacy was evaluated using two measures: (1) NVS or Newest Vital Sign (Weiss et al), and (2) Cloze procedure (Taylor). The NVS is

a brief 6-question screening test developed from a series of medical scenarios and based on authentic health-related instructions. Using information from a nutrition label, NVS tests both prose and numeric comprehension. Scores less than four indicate limited health literacy. This NVS measure correlates well with other health literacy assessment tools such as the Test of Functional Health Literacy in Adults (TOFHLA) (Parker et al).

The Cloze procedure involves deleting words from written passages by counting out every nth word and having participants fill in the blanks. Cloze tests for this study involved deleting every 7th word from two government web pages about public health disasters. Three multiple-choice options were provided for participants to complete underlined blanks. The first website used for testing was Ready.gov, a national government source (http://www.ready.gov/america/beinformed/biological.html), the second resource was state-specific from South Carolina's Department of Health and Environmental Control (http://www.scdhec.gov/administration/ophp/avian_flu.htm). The federal web page was on biological terrorism; the state web page was on avian influenza. Thirty-eight blanks within 16 sentences were on the national page; 28 blanks within 12 sentences were on the state information page. The two websites selected were among the top consumer-oriented disaster preparedness websites located through the Google search engine in a recent Internet-based study (Friedman, Tanwar, and Richter). Both pages were written at a lower reading level compared with other resources – Grades 8-9 according to Flesch-Kincaid (Kincaid et al), a commonly used instrument to evaluate readability of health education materials (Friedman and Hoffman-Goetz, *Cancer Education*; Friedman, Hoffman-Goetz, and Arocha). Both Cloze and NVS tests were administered verbally. Participants were also provided with a written copy of the test questions. Scoring of Cloze tests was as follows: (1) >56% (or 0.56/1.0) = adequate comprehension; (2) 44%–56% = marginal comprehension (text was difficult); (3) <44% = inadequate comprehension (text was extremely challenging). One hundred percent correct responses yields a score of 1.0 (Estey, Musseau, and Keehn). Similar to previous health comprehension research (Friedman and Hoffman-Goetz, *Journal Of Health Communication*), scores were analyzed using nonparametric tests (chi-squares), appropriate for small sample sizes and for variables that are not normally distributed. Values are presented as means ± 1 standard error.

Interview Protocol

Cloze and NVS measures only provide an estimate of what people understand. They do not serve to assess additional components of comprehension such as effects of test anxiety, prior knowledge, or coherence of understanding. Thus, interview questions about participants' understanding and opinions of the disaster information were used to complement NVS and Cloze test results.

Following health literacy assessments, participants were asked eight interview questions about their knowledge, opinions, and information needs regarding disaster preparedness. Sample questions were: Have you ever independently looked for information about emergency preparedness? Have you ever asked someone to look for information about preparedness on your behalf? What specific type of information would you like to be receiving about

how to prepare for or how to respond during a disaster? What information do you want to learn about preparedness so that you feel comfortable taking care of yourself and your families during an emergency situation? What did you think of the disaster information presented today? Two of the authors administered the health literacy assessments and conducted the in-depth interviews.

Interviews were digitally recorded, transcribed verbatim into Microsoft Word® 2003 by a professional transcription service, and organized into NVivo7 (QSR). All transcripts were edited to remove personal identifiers and analyzed for themes regarding comprehension and information needs about emergency preparedness. Transcripts were analyzed sentence-by-sentence for overlapping or contrasting themes using a constant comparative method (Glaser and Strauss). Quotes representing emerging themes were noted. All study procedures were approved by the University's Office of Research Compliance prior to participant recruitment and data collection. Participants were provided with a gift certificate in appreciation of their time and contributions to the study.

Results

Participant Demographics
Twenty individuals (men, n=13; women, n=7) participated in this study. Results from background questionnaires administered verbally and/or in writing after interview sessions showed the mean age of participants to be 53.1 ($\pm$ 2.9, range 36-80 years); 3 participants chose not to report their age. The majority of individuals were African American (n=15 or 75%). All participants spoke English as their first language. Most participants were married (n=12 or 60%), few were single (n=5 or 25%), separated (n=2 or 10%) or widowed (n=1 or 5%). Most participants (n=15 or 75%) reported less than high school education.

The majority of individuals (n=13 or 65%) reported doctors as their preferred source of general health information on the questionnaire. Men most often consulted their doctors (n=9 or 45%). Females also consulted family, friends, and coworkers. A number of men (n=6 or 30%) also listed doctors as their preferred source for disaster preparedness information while only 1 (5%) female participant did so. Most individuals relied on television for both general health (n= 13) and disaster (n=11) information. Just over half of participants had access to and searched the Internet over the past year (n=11), however, only one male participant listed the Web as a source specifically for disaster information. When asked to rate their understanding of emergency preparedness in general, 35% said "good," 20% said "fair," 15% each said "excellent," "very good," and "poor."

Disaster Literacy Results

The mean NVS score was 3.11 $\pm$ .40 (range 0-6), indicating limited health literacy of study participants. One participant had a score of zero. The average score for the 4 quantitative NVS questions was 1.52 $\pm$ .34 / 4.00 or 38%; average score for 2

qualitative NVS questions was 1.58 ± .16 /2.00 or 79%. Individuals who used the Internet to search for general health information had significantly higher overall NVS scores compared with those who did not (Mann-Whitney U=21.500, p=.029). Only marginal differences were found in NVS scores between those individuals with or without computers (Mann-Whitney U=26.500, p=.070). Differences in NVS by ethnic group were not found to be significant, though African American participants scored the lowest.

Average Cloze scores were .46 ± .04 (range: .29 —.86) for the resource on avian influenza and .48 ± .03 (range: .21 —.79) for the web page on biological attacks, indicating marginal disaster comprehension by participants. Overall, more people showed inadequate understanding of the avian flu article (n=13 or 65%) compared with marginal (n=2 or 10%) or adequate (n=5 or 25%), whereas an equal number of participants had inadequate or marginal comprehension (n=8 or 40%), and fewer had adequate comprehension (n=4 or 20%) for the biological disaster article.

Men showed slightly higher understanding (±.04) of information on preparing for biological attacks vs. avian flu according to Cloze; women received higher Cloze scores (±.10) for the article on avian flu (differences not significant). More specifically, 42.9% of women vs. 15.4% of men showed adequate comprehension of avian flu. For the resource on biological terrorism, 28.6% of women vs. 15.4% of men had adequate understanding. African Americans had inadequate understanding of avian influenza and marginal comprehension of biological terrorism; other participants (e.g., whites) had adequate comprehension of this information (avian: $t_{(df=18)}$=-3.361, p=.003; biological: $t_{(df=18)}$=-2.125, p=.048). More participants with inadequate comprehension according to Cloze on both Web articles rated their understanding as good (6/13 on avian influenza, 4/8 on biological attacks). Differences in Cloze comprehension by participant age were not significant. Table 1 presents NVS and Cloze score results by participant demographics.

	NVS TOTAL (/6)	NVS quantitative (/4)	NVS qualitative (/2)	Cloze* Avian	Cloze* Biological
Gender					
Male (n=13)	2.69 ± .41	1.25 ± .37	1.42 ± .23	43 ± .04	47 ± .04
Female (n=7)	3.86 ± .74	2.00 ± .65	1.86 ± .14	.53 ± .06	.50 ± .06
Age					
30-40 (n=3)	3.67 ± .67	2.00 ± .58	1.67 ± .33	.55 ± .15	.54 ± .14
41-50 (n=7)	3.00 ± .69	1.29 ± .52	1.71 ± .29	.45 ± .07	.44 ± .06
51-60 (n=3)	3.00 ± 1.52	1.33 ± 1.33	1.67 ± .33	.38 ± .03	.35 ± .02
61-70 (n=3)	4.00 ± 1.00	3.50 ± .50	1.00 ± 1.00	.44 ± .08	.51 ± .02
71-80 (n=1)	1.00	0.00	1.00	.43	.58
Ethnicity					
African-American (n=15)	2.86 ± .50	1.43 ± .42	1.43 ± .20	.40 ± .03**	.44 ± .03**
Other (n=5)	3.80 ± 1.30	1.80 ± 1.30	2.00 ± .00	.63 ± .14	.59 ± .16
Education					
Less than high school (n=15)	3.13 ± .81	1.64 ± 1.54	1.50 ± .76	.43 ± .15	.46 ± .14
High school or GED (n=5)	3.00 ± .1.58	1.20 ± 1.30	1.80 ± .45	.55 ± .19	.55 ± .15
Own Computer					
Yes (n=8)	3.88 ± .48	2.00 ± .46	1.88 ± .13	.46 ± .06	.46 ± .06
No (n=12)	2.58 ± .51	1.18 ± .46	1.36 ± .24	.46 ± .05	.49 ± .04
Use Internet					
Yes (n=10)	4.00 ± .49**	2.10 ± .48	1.90 ± .10	.51 ± .06	.51 ± .05
No (n=10)	2.20 ± .44	.89 ± .39	1.22 ± .28	.41 ± .03	.46 ± .04
Self-Rated Understanding					
Poor (n=3)	1.33 ± .88	. 33 ± .33	1.00 ± .58	.40 ± .05	.40 ± .05
Fair (n=3)	3.50 ± .65	1.50 ± .33	2.00 ± .00	.55 ± .12	.55 ± .12
Good (n=7)	3.14 ± .59	1.67 ± .67	1.50 ± .34	.40 ± .03	.40 ± .03
Very Good (n=4)	4.00 ± 1.00	2.00 ± 1.00	2.00 ± .00	.54 ± .16	.54 ± .16
Excellent (n=3)	3.33 ± 1.45	2.00 ± 1.15	1.33 ± .33	.46 ± .07	.46 ± .07
*Cloze scores: Inadequate = <.44/1; Marginal = .44-.56/1; Adequate = >.56/1 **p<.05					

Table 1: Health Literacy Assessments: Newest Vital Sign and Cloze Results

Interview Findings

Participants were also asked a series of questions about their disaster literacy practices including information-seeking behaviors, opinions about disaster information they read, and information they would like to receive about how to prepare for and act during public health disasters. Interview findings are classified into three categories: (1) multiple perceptions about disasters and disaster information; (2) disaster preparedness information needs and preferences; and (3) barriers to seeking and receiving disaster preparedness information. Relevant quotes are represented below. Table 2 shows categories and themes that emerged from in-depth analysis of these interviews.

Categories	Themes
1. Multiple Perceptions about Disasters and Disaster Information	(a) Varying Ideas About What Constitutes an Emergency (b) Importance of Having Information
2. Disaster Preparedness Information Needs and Preferences	(a) Multimedia Information is Most Helpful (b) Need for Diagrams and Pictures (c) Need to Know Where to Go
3. Barriers to Seeking and Receiving Disaster Preparedness Information	(a) Frustration with Difficult/Technical Language (b) Anxiety and Worry about Disasters (c) Limited Access to Resources

Table 2: Disaster Preparedness Interview Results: Categories and Themes

(1) Multiple Perceptions of Disasters and Disaster Information

Participants provided various descriptions of events that, in their opinion, constituted public health disasters or emergency situations. When asked about disasters they were concerned about, participants expressed the following:

> "Emergency includes needing to read the labels on what I am allergic to and basically … stuff like that."

> "…when it is time to save somebody's life or something like that … if they are having a heart attack … abusing somebody … [need to] know what to do about that."

> "As long as it is an emergency and it is something dealing with your health or your family, then all of them I consider to be an emergency."

> When presented with the two Web articles on public health emergencies, participants were more concerned about the risk of avian influenza than they were about biological terrorist attacks. For instance:

"Well I bet with that bird flu, we need to be, you know, really protected because if it spreads, it could kill a lot of people."

This was also the first time some participants had heard about avian influenza.

"The one just about the birds or whatever, you know I really hadn't heard about the birds. Now I heard about the cows, you know the disease and stuff. Now I heard about the anthrax … but I hadn't heard nothing about no birds."

Participants reported that having information about how to prepare for a public health disaster would help them feel more comfortable and knowledgeable about what to do to assist themselves, family members, and friends during an emergency. Being equipped with information or instructions was the first important step to taking action.

"Well I think it would mean a lot because you could look out for your family much more. You could prepare much more for your family and whatever disaster is happening."

"If I become more knowledgeable about some information … I will be more comfortable about what to do and definitely I will share that information with my family and if I feel like I need to prepare some equipment and some material and I will try to buy it or I will consider to buy it."

(2) Disaster Preparedness Information Needs and Preferences
Participants listed a wide range of sources from which they would like to receive information about disasters including television, radio, videos, bulletin boards, seminars, one-on-one information sessions, newspapers, telephone calls, telephone books, and the Internet. Multimedia and multiplatform dissemination strategies were most often requested.

"I think especially if you could get the information on TV or radio or people going door to door."

"I think the best way is that somebody comes out and talks with you about it."

"… because everyone doesn't know how to read so if it were presented in a video, they can see and hear."

A recommendation made by a number of the participants for preparedness resources was to include diagrams and images about the emergency itself.

"…they need somebody to take a picture so they can see it is really bad or whatever … sometimes I don't read it but see the picture and I'm good to go."

Only one participant reported having previously searched for disaster preparedness information. Others said they had never before searched for this

type of information or asked anyone to look for it on their behalf. Seeing this information on television or hearing it on the radio was considered actively seeking out emergency information by many participants.

> "And sometimes you can be watching TV and they will cut the program off and tell you what happened, something terrible had happened, you know."

The majority of participants associated disaster preparedness with knowing where to go—that is, evacuation information needs—in case of an emergency. For example:

> "Knowing what we would need to take with us if we had to leave our house for more than a few days."

> "I would need to know where to go, what to do, and what to prepare for. What kind of weather, what kind of storm, what kind of emergency? I would like to know where to go safely, where me and my family can safely get out of harm's way."

Fewer people spoke about tangible items and supplies they would need to prepare for an emergency.

> "That is number one. We need to know what we're going to need in case the lights and electricity … go out. You definitely need to know that. What we would need and a time to get out and get it because at the last minute I know sometimes they come up really fast, at the last minute everybody is trying to get out to the store."

(3) Barriers to Seeking and Receiving Disaster Preparedness Information

Three barriers to seeking out preparedness information emerged from the interviews: (1) frustration with difficult/technical language; (2) anxiety and worry about disasters; and (3) limited access to resources.

Participants frequently spoke about the technical difficulty of the information itself. They were frustrated that they could not understand scientific information about disasters.

> "I saw hard words, big words. So I think that threw me off some … You have to be a better reader than I am…I don't think they have to make it so complicated."

> "…everyone can't read and write … we barely learn the easy words so this would be kind of difficult."

An additional barrier that prevented individuals from seeking out information was worry about the uncertainty of the event itself.

> "… for example, is the water contaminated? Because the news when they flash it, if something breaks out like that, we don't know what to do. Unless sometimes me and my wife stock water and stuff like that in the house but you never know if it comes at a time where we might not have it. Can we go out? Is it safe to go out in the air?"

Feelings of anxiety about having to find health emergency information were expressed repeatedly by participants:

"I couldn't find it myself. I would ask so many questions I would be crying out loud, so I really don't know where to start at."

"I know there is information out there but I don't think I am prepared to take care of it … I really in particular really worry about [that]."

A final barrier to seeking out preparedness information was lack of access to it. Either they did not have access to information resources or they did not know where to find accurate and reliable information about how to prepare for disasters.

"In some of the places they don't even have Internet … and the Internet will help make it easier for me to access."

"I think they should put in the newspaper and I think it should be on the front page so nobody will miss it because sometimes when you hide it on the inside most people go over and don't look at it."

Discussion

This exploratory study examined literacy practices regarding disaster preparedness by adult learners. When asked during interviews about their sources of disaster information, most participants mentioned their reliance on broadcast media, specifically television. Previous research has shown adequate information recall and retention after viewing health and science-related programming on local television newscasts (Miller et al). Authors concluded that health and science information in broadcast media could indeed improve viewers' existing schemas or cultivate development of new schemas for less well-known concepts. Limited research has been conducted on the framing and construction of disaster messages in the media. One recent study on the construction of SARS (severe acute respiratory syndrome) in mass media news reports found that topics were most often discussed in terms of risk using strong language and arguments and relayed by expert sources such as researchers and health professionals (Berry, Wharf-Higgins, and Naylor). An examination of the cultural or linguistic suitability of this information or the appropriateness of the sources relaying this information was not conducted.

Findings of the current study revealed inadequate or marginal understanding of health and disaster information by African American adult learners as measured by the Newest Vital Sign assessment tool and Cloze testing. The NVS mainly assesses quantitative understanding of health information in two-thirds of questions. Numeracy is a significant aspect of health literacy and includes quantitative knowledge and risk information needed to manage one's health effectively. Despite having adequate understanding of prose text, many individuals have limited practice with quantitative information (Davis

et al). Being able to understand and apply numeric information is particularly important in an emergency situation in which individuals are presented with risk or probability information about the occurrence of an event or chances of survival.

While the National Assessment of Adult Literacy (NAAL) found that men typically score higher on numeric tests (Kutner et al.), female participants in this study showed better overall results on both the NVS tool and Cloze tests. Perhaps this finding is due to more frequent health information seeking of women and women's familiarity with health-related instructions compared with men. For instance, a previous study on treatment decision-making of breast cancer patients found that 22% of women wanted to choose their own cancer treatment and 44% wanted to decide on a treatment in collaboration with their physicians (Degner et al.). On the other hand, men tend to be passive seekers of health information. For example, close to 60% of men diagnosed with prostate cancer chose to defer treatment decisions to physicians (Davison, Degner, and Morgan). Men listed doctors as a source for disaster information on the background questionnaires. Since men do not typically search for health information independently, perhaps they were not aware of more appropriate sources about public health disaster preparedness.

African American participants presented lowest scores on the health literacy instruments. Results from the NAAL show that close to 70% of African Americans have basic or below basic literacy skills compared with 32% of whites (Kutner et al.). Unfortunately health information is often written at high reading levels and difficult for average readers to understand and use (Friedman, Hoffman-Goetz, and Arocha; Kaphingst, Zanfini, and Emmons). Furthermore, health messages in mainstream media do not often present information in a culturally tailored manner that educates diverse audiences about preventive health actions (Hoffman-Goetz and Friedman). Without attention to culture, individuals may consider disaster information to be irrelevant if it does not acknowledge cultural and spiritual beliefs or attitudes about health (Kreuter, Strecher, and Glassman). A recent study conducted with 53 African Americans who did not evacuate New Orleans before Hurricane Katrina found that low perceived severity of the effects of the hurricane due to inconsistent instructions was a key reason for not evacuating (Elder et al.). Recommendations from this research include the need for culturally sensitive communication and logistics plans for the evacuation of minority and lower income groups. In another study examining media communication issues and concerns during disaster situations, expert advisors also expressed that the most critical problem was lack of coordination between information officers and journalists, as well as limited knowledge of resources to assist with the evaluation and dissemination of disaster information (Lowrey et al.). If such communication concerns exist among health professionals, it will be especially difficult for the lay public to access, understand, and use accurate and credible disaster information.

The current research examined literacy from a social practices perspective of health literacy and outcomes, specifically by exploring key organizational

influences of access to and difficulty of media-based resources on individuals' capacity to comprehend and respond to disaster preparedness information. Organizational or system factors can influence literacy, which in turn may affect acquisition of awareness and new knowledge. Wray and colleagues proposed applying a communications framework to terrorism preparedness (232). Although not focused necessarily on literacy, their disaster communications model also considers both population/system level theory (social amplification of risk) and individual model constructs (persuasion theory, risk communication theory, behavioral theory, and elaboration likelihood model) to be relevant. Although the current research included a relatively small sample of participants (n=20), the intent was not to generalize interview results but to examine in-depth a sample of adult learners' information needs and understanding about disaster preparedness information.

Study Implications And Recommendations

Just over half of disaster web pages analyzed in an Internet content analysis study contained pictures or illustrations (Friedman, Tanwar, and Richter). Visuals with easy-to-read captions and inclusion of glossaries are recommended for simplifying disaster risk and preparedness information. Research suggests that images and diagrams play an important role in health and science communication and proposes a framework of visual literacy as a key component of effective communication among both expert and lay audiences (Trumbo). Text alone is more difficult to understand compared with that which is accompanied by visuals (Doak et al.). Visual pictographic scales have also been helpful in evaluating adherence to medication among low literate individuals living with HIV/AIDS (Kalichman et al.).

Participants' quotes also revealed the need to know what they themselves should do during a disaster; they did not use the third-person to discuss what *other* people needed to know. This suggests that disaster preparedness materials should not only be visually appealing, but also interactive or designed so that information is tailored to individuals' specific needs (e.g., plain language, with recommendations for action and messages that do not increase anxiety) and circumstances (e.g., easily accessible and available materials because of lower income and education). As mentioned during interviews, participants were also dealing with other personal health issues (e.g., accessing and affording health care, medical conditions) and not always thinking about large scale emergencies. Thus, even if disaster preparedness information is provided in multiple formats using visual communication tools, successful communication will also depend on understanding the culture and norms among lower literacy and lower income populations as well as the characteristics of their social networks. Future research grounded in a social practices framework should involve members of the participants' social networks including literacy instructors who may be the only sources of general health or emergency information for this particular population.

Participants expressed the desire to use the Internet for up-to-date disaster information. Unfortunately many did not know how to use the computers located at the literacy center. It is important to guide people to accurate, credible, and consumer-oriented information. A number of preparedness websites have resources specifically for public health professionals (e.g., http://nccphp.sph. unc.edu/training/index.html); others have general information for the public, with more detailed resources for professionals (http://www.bt.cdc.gov/) Some emergency preparedness websites now recognize the importance of plain language and culturally appropriate information (e.g., Healthy Roads Media http://www.healthyroadsmedia.org/topics/emergencies.htm).

A recent study of Hurricane Katrina evacuees living in Houston suggests that only removing complications related to shelter and transportation during disasters might do little to improve preparedness among poor, minority communities (Eisenman et al.). Responsible disaster communication will also be required, especially appropriate communication by mass media and public officials (Arnold). Social capital as accessed through social networks may be disrupted during disaster situations and information typically received through strong community connections will most likely be delivered by "strangers" (e.g., mass media, information officers, and rescue workers). It will be important to determine people's perceptions about messenger credibility which could have an effect on their actions during a disaster or in preparation for one.

When asked why he wanted to be able to understand information about public health disasters, one participant said: "I would need to save my family, help my friends." With clearer communication to the public about disaster preparedness by mass media, health information officers, government officials, and emergency preparedness workers, this participant would hopefully have the resources needed to assist his family.

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