

# Public Health Preparedness of Post-Katrina and Rita Shelter Health Staff

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#### Abbreviations:

ARC = American Red Cross  
CDC = (US) Centers for Disease Control and Prevention

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#### Abstract

**Introduction:** During 2005, Hurricanes Katrina and Rita struck the US Gulf Coast, displacing approximately two million people. With >250,000 evacuees in shelters, volunteers from the American Red Cross (ARC) and other non-governmental and faith-based organizations provided services. The objective of this study was to evaluate the composition, pre-deployment training, and recognition of scenarios with outbreak potential by shelter health staff.

**Methods:** A rapid assessment using a 36-item questionnaire was conducted through in-person interviews with shelter health staff immediately following Hurricanes Katrina and Rita. Data were collected by sampling at shelters located throughout five ARC regions in Texas. The survey focused on: (1) public health capacity; (2) level of public health awareness among staff; (3) public health training prior to deployment; and (4) interest in technical support for public health concerns. In addition, health staff volunteers were asked to manage 11 clinical scenarios with possible public health implications.

**Results:** Forty-three health staff at 24 shelters were interviewed. Nurses comprised the majority of shelter health volunteers and were present in 93% of shelters; however, there were no public health providers present as staff in any shelter. Less than one-third of shelter health staff had public health training, and only 55% had received public health information specific to managing the health needs of evacuees. Only 37% of the shelters had a systematic method for screening the healthcare needs of evacuees upon arrival. Although specific clinical scenarios involving case clusters were referred appropriately, 60% of the time, 75% of all clinical scenarios with epidemic potential did not elicit proper notification of public health authorities by shelter health staff. In contrast, clinical scenarios requiring medical attention were correctly referred >90% of the time. Greater access and support from health and public health experts was endorsed by 93% of respondents.

**Conclusions:** Public health training for sheltering operations must be enhanced and should be a required component of pre-deployment instruction. Development of a standardized shelter intake health screening instrument may facilitate assessment of needs and appropriate resource allocation. Shelter health staff did not recognize or report the majority of cases with epidemic potential to public health authorities. Direct technical support to shelter health staff for public health concerns could bridge existing gaps and assist surveillance efforts.

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#### Introduction

During August and September 2005, Hurricane Katrina, followed by Hurricane Rita, struck the Gulf shores of Louisiana, Mississippi, Texas, and Alabama in rapid succession, displacing an estimated two million people. More than 500,000 of these people stayed in a temporary shelter at least one night; and 14 days after the second storm made landfall, >250,000 remained in shelters.<sup>1</sup> The American Red Cross (ARC) is designated in the US National

Response Framework (NRF) under Emergency Support Function 6 (ESF-6) as the support agency for sheltering, but is not the sole source for shelters.<sup>2</sup> According to the Homeland Security Institute, hundreds of the post-Katrina shelters were sponsored by other non-governmental and faith-based organizations (FBOs).<sup>3</sup>

Adding to the shelters' needs were the daunting, prevent health and socioeconomic demographics of this urbanized population. A study of the Katrina-affected population in the Louisiana shelters found that more than half were unemployed or underemployed, two-thirds rented rather than owned homes, nearly half had no health insurance, and 38% depended on some form of public assistance or benefits.<sup>4</sup> For every significant chronic disease (hypertension, diabetes, hypercholesterolemia, chronic lung disease, and mental health problems), the prevalence in the sheltered population was well above that of the national population. Furthermore, the study indicated that 15% of evacuees arrived at the shelters with symptoms of communicable disease (fever, diarrhea). The shelters often were crowded and initially had limited access to fresh water and sanitation facilities, which left this already high-risk population at a greater risk for outbreaks and other public health consequences.

Compounding the poor health of the sheltered population was the breakdown of the public health information systems of Louisiana and Mississippi that normally track outbreaks of communicable and non-communicable disease through surveillance. By displacing local public health personnel and rendering communications ineffective, Katrina hindered the ability of the Gulf States to monitor outbreaks in hundreds of crowded shelters. The US Centers for Disease Control and Prevention (CDC) assisted with creating a surveillance reporting system in the shelters. This system relied on the clinical and public health knowledge of the volunteer health staff in the shelters to identify and report cases of potentially infectious diseases.<sup>5-7</sup>

The combination of a vulnerable population, overcrowding, limited resources, and a lack of routine public health surveillance led to shelter healthcare volunteers being the primary source for disease identification, reporting, and early public health containment measures. The aim of this study is to evaluate the degree of public health preparedness among these responders and identify potential practical recommendations for enhanced public health preparedness in future mass population displacements.

## Methods

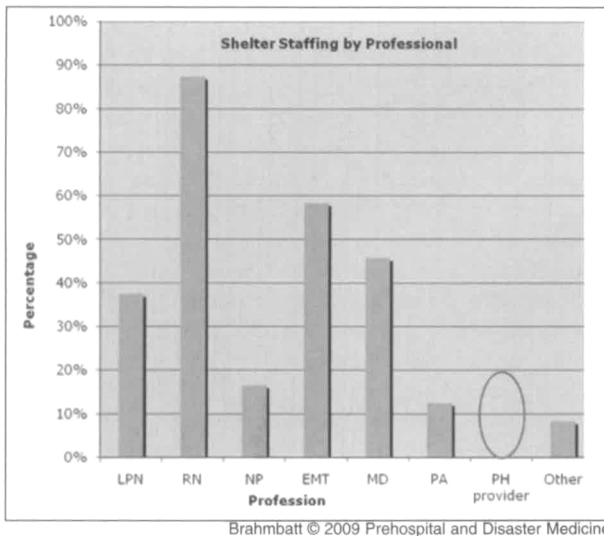
A team of public health-trained nurses and physicians from Johns Hopkins University and the Harvard Humanitarian Initiative assisted the ARC in establishing a public health response capacity immediately following the population displacements due to Hurricanes Katrina and Rita. This was a multifaceted effort to rapidly assess shelters, determine the burden of disease among evacuees, and establish a communicable disease surveillance mechanism for the shelters in Louisiana, Mississippi, and Texas. This study is one of the components initiated during the draw-up, response, and immediate aftermath phases of Hurricane Rita, 21 September–02 October 2005.

The survey was conducted from 24 September to 02 October 2005. Lists of shelters from each of five major ARC Emergency Operations Centers in Texas (Austin, Bryan-College Station, Houston, Nacogdoches, and San Antonio) were used to determine the sampling frame. However, the rapidity with which shelters expanded, collapsed, combined, and closed permitted strictly convenience sampling of the shelters open at the time of the survey. A 36-question survey was developed to assess the: (1) public health capacity present in ARC sheltering operations; (2) level of public health awareness among staff; (3) the level of public health training received by staff in preparation for mass-sheltering operations; and (4) the staff's level of interest in technical support for public health concerns. At each shelter, shelter managers and health staff were interviewed with respect to the following: (1) their recall of shelter demographics at current and peak population periods; (2) the qualifications of health providers working either full- or part-time in the shelter; (3) their perceptions of burden of disease within the shelter population; (4) the procedures for assessing and recording the health status of evacuees in the shelter population; (5) the patterns of referral for more advanced health needs; (6) the presence of protocols for notification of public health officials regarding public health problems; (7) the level of public health training of shelter health staff; (8) their perceptions of the adequacy of their public health training to prepare them for work in a mass shelter; and (9) their knowledge of local facilities for public health and medical referral.

Health volunteers also were asked how they would manage 11 clinical scenarios with possible public health implications and whether they would: (1) independently monitor the situation within the shelter; (2) notify local public health authorities and/or refer the case to a higher level of medical care; or (3) a combination of these actions. Among these were eight scenarios adapted from the surveillance form used by the CDC in the hurricane-affected area that described shelter residents with symptoms representing epidemic potential that would require further medical care and public health referral. Three other scenarios were added that would likely be encountered during routine medical operations. The 11 scenarios included:

1. An ill-appearing child with a fever (>100.4°F; >38°C);
2. A child or adult with fever and neck stiffness and rash;
3. An evacuee with hemoptysis;
4. An evacuee who verbalizes the desire to hurt him or herself or others;
5. A child or adult with fever and cough;
6. Five cases of flu-like illness;
7. One child with watery diarrhea;
8. One case of bloody diarrhea;
9. Greater than five cases of sudden-onset vomiting within six hours;
10. An evacuee complaining of acute chest pain; or
11. An evacuee with a known seizure disorder without access to medications.

The shelter staff members also were surveyed regarding the perceived utility of a public health resource that could be accessed for assistance with public health questions should such scenarios actually occur. Responses were



**Figure 1**—Percentage of shelters with health professionals by training (EMT = emergency medical technician; LPN = licenced practical nurse; RN = registered nurse; NP = nurse practitioner; PA = physician assistant; PH = public health)

logged into an Excel database and descriptive data was analyzed using Excel for Mac 11.3.5 (2004, Microsoft Corporation, Redmond, WA). This study was granted an exemption by the Harvard School of Public Health Institutional Review Board.

## Results

### Characteristics

Forty-three health staff members at 24 shelters in the five regions of emergency operations were surveyed. The population of sampled shelters varied widely, with an average size of 925 persons per shelter. While the overwhelming majority of shelter residents were affected by Hurricane Rita, approximately 70% of evacuees had been displaced previously by Hurricane Katrina.

### Shelter Health Staff

Nurses (licensed practical nurses (LPNs), registered nurses (RNs), and nurse practitioners (NPs)) made up the majority of shelter health volunteers and were present in 93% of surveyed shelters (Figure 1); more than half of the shelters (55.8%) were staffed with first responder staff (emergency medical technicians (EMTs) and paramedics), with a smaller number (39.5%) having physician volunteers (medical doctor (MD)/doctor of osteopathic medicine (DO)) or physician assistants (9.3%). There were no public health providers present as staff in any of the shelters.

### Burden of Disease

The perception of the shelter health providers was that most evacuees either were in good health or had few medical problems (60% of respondents). Forty of 43 (93%) shelter health stations maintained a log of patient visits. However, only 16 of 43 (37%) shelters had a systematic method for screening evacuees for acute health issues and identifying chronic health needs when they arrived at the shelter.

### Level of Preparedness

While a majority (57%) of shelter health staff reported some prior experience in a disaster setting, only 22% reported having worked in an ARC shelter in the past. Seventy-nine percent reported receiving some formal ARC training prior to their deployment, but only 48% felt that their training was adequate. Less than one-third of health managers had any public health training, and only 55% had been given any public health information specific to managing the health needs of evacuees.

### Public Health Knowledge and Awareness

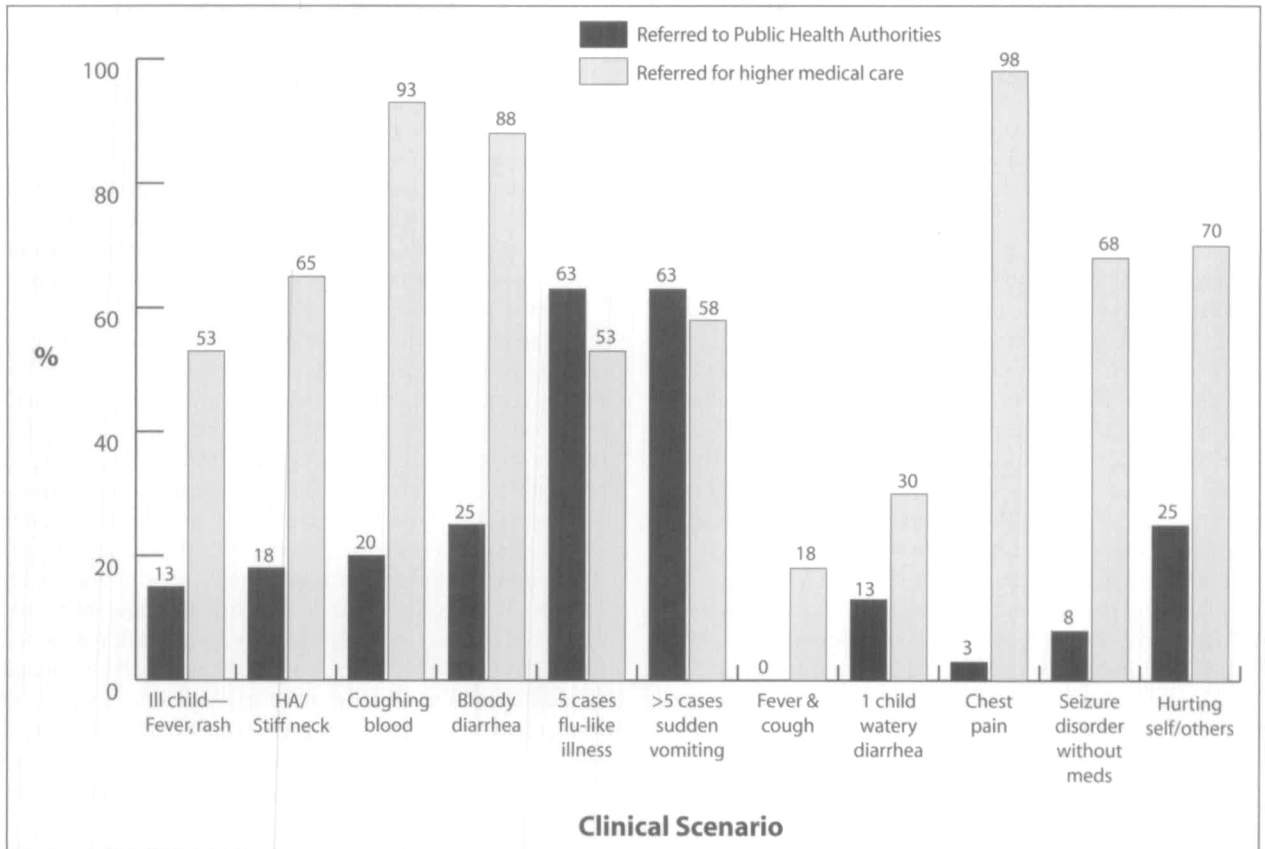
More than half (58%) of shelter health staff reported having been visited by local public health officials with a similar percentage (59%) reporting that they knew how to contact public health authorities should the need arise. Despite this, 93% believed greater access to health and public health experts, such as a toll-free public health hotline staffed by public health practitioners who could investigate and/or answer questions related to potential outbreak concerns, would be welcome.

When presented with the clinical scenarios, there was widespread recognition of the need to refer these cases for a higher level of medical care, but much less recognition of the public health implications of the scenarios (Figure 2, Table 1). More than three out of four times, respondents did not correctly identify six of the eight clinical scenarios with epidemic potential and the subsequent need for public health notification and referral. The two scenarios that involved clustering of infectious disease cases (5 cases of flu-like illness and >5 cases of sudden onset vomiting within six hours) were more likely to be correctly identified (nearly two out of three times) as having epidemic potential and to be referred to public health officials. Figure 1 and Table 1 illustrate the under-recognized scenarios with outbreak potential, the communicable diseases that could be associated with the symptom presentation, and the stark difference between staff readiness to make medical referrals and their disinclination to notify public health authorities. The three scenarios that represented medical referral alone (chest pain, known seizure disorder without medication, the desire to hurt self or others) were correctly identified for medical referral by nearly all shelter health providers.

## Discussion

Given the significant potential public health implications associated with mass population displacement following Hurricanes Katrina and Rita,<sup>8-14</sup> this study assessed the level of public health awareness among shelter healthcare volunteers and recommended interventions that would support a public health framework for future organizational disaster responses. At the shelters, anecdotal evidence showed that while health volunteers were extremely capable of providing necessary first aid in sheltering conditions, they were ill-prepared to view the sheltered population within an epidemiologic framework or recognize patterns of disease presentations in the sheltered population that would be considered to have outbreak potential.

In this study, there were no public health providers or those formally trained in public health present as staff in any of the shelters surveyed. The ARC provides pre-deploy-



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Figure 2—Management of clinical scenarios

Key under-recognized clinical scenarios	Potential illness with public health significance	% who would refer for higher medical care	% who would notify public health officials
Ill-child with fever and rash	Meningitis/sepsis	53	15
Headache with stiff neck	Meningitis	65	18
Hemoptysis (coughing blood)	Tuberculosis/pneumonia	93	20
Bloody diarrhea	Infectious bacterial enterocolitis	88	25
5 cases of flu-like illness	Influenza	53	63
>5 cases of sudden vomiting	Food poisoning	58	63
Fever and cough	Bacterial pneumonia	18	0
1 child with watery diarrhea	Rotavirus	30	13
Chest pain	None	98	3
Known seizure disorder with no medication	None	68	8
Hurting self/others	None	70	25

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Table 1—Clinical scenarios, outbreak potential, and respondent actions

ment volunteer training in disaster response, community resource mobilization, first aid, and cardiopulmonary resuscitation, but they do not have courses on public health preparedness and response for sheltered populations. It is

unclear if any other sheltering organizations, particularly smaller groups and spontaneous shelters, provide any health-related training for their shelter volunteers. Although 79% of shelter staff had received ARC training

prior to deployment, only 55% had received any public health information related to shelter care and nearly half (48%) were not satisfied with their pre-deployment training. Based upon individual conversations with shelter staff, many lacked confidence to monitor public health within the shelter environment. They also expressed widespread interest in direct access to health and public health experts to discuss and report cases with outbreak potential. A recent paper by Cavey *et al* described a toll-free hotline that connected shelter volunteers with medical and public health experts for immediate consultation and reporting of potential cases in Mississippi shelters after Hurricane Katrina.<sup>15</sup>

Shelter staff was ill-prepared to identify the health and public health needs of evacuees. Although all had volunteer health workers available at least part-time, only 37% of the shelters had a systematic method for screening the health-care needs of evacuees upon arrival. Of concern was the volunteers' lack of recognition of the need for public health reporting and response to disease presentations with outbreak potential. Six of the eight with outbreak potential did not elicit a public health notification from respondents >75% of the time. However, the majority of these potentially infectious cases would have been referred to a higher level of medical care. The scenarios most frequently referred to public health authorities involved "clustering" (e.g., five cases of flu-like illness or five cases of sudden vomiting within six hours), but a single infectious case among a population sheltered in close quarters should have been sufficient to trigger a notification of public health authorities. This lack of recognition of the public health implications of individual infectious cases can impair the CDC's shelter surveillance efforts that rely on the clinical and public health skills of the volunteer shelter health staff.

Conceivably, shelter health staff may have assumed that public health notification would be handled by the hospitals where evacuees were sent for further medical care, but even in non-disaster times, emergency departments may not reliably convey many cases of reportable disease to public health authorities. During large-scale evacuations, local health facilities typically face an overwhelming surge in patient volume, and the focus of providers is centered on treatment rather than population-based infection control. Staff of healthcare systems also may not recognize that shelter evacuees are being treated, nor be able to identify a cluster of cases from a single shelter. Thus, it is crucial for shelter staff to be proficient in the early recognition and reporting of potential public health issues.

The volunteer health workers recognized emergency medical conditions and referred them to higher levels of care >90% of the time. With emergency psychiatric illness, the volunteer health workers were less likely to recognize the need to refer the patient for further screening and care (74%). The burden of psychiatric illness and emotional distress among evacuees has been highlighted in numerous studies, but there remains less recognition of the importance of these conditions compared to other health issues. Parker *et al* proposed a conceptual framework for psychological first-aid training to complement wider community-oriented, mental health services.<sup>16</sup>

The early identification of serious infections and clusters of illness is the most important step in preventing

widespread outbreaks. An understanding of disease patterns and public health implications is essential because the crowding and sanitation challenges in shelters potentially can promote the spread of infectious disease. Recognition of potential public health threats may result in proactive recommendations to disinfect, decontaminate, or isolate. Notwithstanding, isolation procedures may be difficult to implement among displaced populations, and when separation of family members is required, the emotional and mental health needs of evacuees must be taken into consideration.

Certain limitations are acknowledged with this study. The shelters at which the surveys were conducted were selected through convenience sampling. As a result of the rapid pace at which shelters were consolidated, contracted, or closed following the hurricanes, the shelters at which surveys were administered represent those with the largest or most stable populations. This does not affect the findings as it could be argued that the better established shelters should have the greatest resources at their disposal, and thus, be the best prepared from a medical or public health standpoint. In some situations, shelter staff members that were surveyed only recently had been assigned or reassigned to the shelter in which they worked, however, all functioned as staff-in-charge. Finally, although the total number of respondents was small, they are a representative sample of shelter health staff. Findings, while suggestive, may not necessarily be generalized to other jurisdictions or settings in which ARC conducted shelter operations.

There are a number of measures that could enhance the public health capacity for sheltered populations during a disaster response. The most important recommendation would be that shelter workers should receive specific public health training prior to deployment. This training can be supplemented with "just-in-time", pre-deployment education and training at the onset of disaster sheltering operations and with making public health educational material available at each shelter. An understanding of the scope of work along with a fundamental grasp of public health principles may reduce anxiety and stress levels among staff regarding anticipated work-related duties.<sup>17</sup> Further research on optimizing public health education and training for shelter staff is needed.<sup>18</sup>

Sheltering organizations should develop a standardized acute and chronic health screening instrument to use when evacuees register. This could be used to identify immediate health needs (e.g., evacuees arriving without their medications) as well as acute illness using a simple checklist of symptoms and reportable conditions. In light of rapidly opening and closing shelters coupled with the transient nature of shelter populations, this dataset would better prepare shelter staff to inform public health officials and provide estimates of critically needed resources.

In addition, improving public health reporting channels to not just report cases, but to share information about shelter conditions would facilitate coordination with other relief agencies. The suggestion that a toll-free hotline be available to provide further backup and respond to public health-related inquiries received overwhelming support (93%) from shelter staff respondents.

Finally, since the Federal Emergency Management Agency (FEMA) and the ARC are designated as the leading organi-

zations for mass care under ESF 6 of the NRF, they should guide development of general operating procedures and protocols as well as related training material regarding public health issues. Recognizing the importance of public health and available resources to support sheltering operations is a component of population-based planning that cannot be overstated.

### Conclusions

Healthcare volunteers tasked with providing health services to sheltered populations are not prepared for the public

health consequences that are likely to occur when vulnerable populations with marginal health indices are displaced by disaster. Agencies involved with sheltering operations should mandate pre-deployment public health education and training, including a shelter intake, health screening instrument and a basic understanding of disease surveillance. Direct technical support, linked to regional and national public health agencies, should be made available to shelter health managers as public health concerns arise and require consultation and investigation.

### References

1. Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina: A Failure of Initiative. U.S. Government Printing Office. Available at <http://www.gpoaccess.gov/congress/index.html>. Accessed 13 October 2008.
2. Department of Homeland Security: National Response Framework Resource Center. Available at <http://www.fema.gov/emergency/nrf>. Accessed 12 October 2008.
3. Homeland Security Institute: Heraldung unheard voices: The role of faith-based and non-governmental organizations during disasters. Available at [http://www.homelandsecurity.org/HsiReports/Herald\\_Unheard\\_Voices.pdf](http://www.homelandsecurity.org/HsiReports/Herald_Unheard_Voices.pdf). Accessed 14 October 2008.
4. Greenough PG, Lappi MD, Hsu EB, Fink S, Hsieh YH, Vu A, Heaton C, Kirsch TD: Burden of disease and health status among Hurricane Katrina-displaced persons in shelters: A population-based cluster sample. *Ann Emerg Med* 2008;51(4):426–432.
5. Centers for Disease Control and Prevention (CDC): Injury and illness surveillance in hospitals and acute-care facilities Aater Hurricanes Katrina and Rita—New Orleans Area, Louisiana, September 25–October 15, 2005. *MMWR* 2006;55:35–37.
6. CDC: Surveillance in hurricane evacuation centers—Louisiana, September–October 2005. *MMWR* 2006;55:32–35.
7. CDC: Morbidity surveillance after Hurricanes Katrina—Arkansas, Louisiana, Mississippi, and Texas, September 2005. *MMWR* 2006; 55(26):27–31.
8. Vest, JR, Valadez, AM: Health conditions and risk factors of sheltered persons displaced by Hurricane Katrina. *Prehosp Disaster Med* 2006;21(2):55–58.
9. Brodie M, Weltzien E, Altman D, Blendon R, Benson J: Experiences of Hurricane Katrina evacuees in Houston shelters: Implications of future planning. *Am J Public Health* 2006;96(5):1402–1408.
10. Laditka S, Laditka J, Xirasagar S, Cornman C, Davis C, Richter J: Providing shelter to nursing home evacuees in disasters: Lessons from Hurricane Katrina. *Am J Public Health* 2008;98(2):1–6.
11. Coker AL, Hanks JS, Eggleston KS, Risser J, Tee PG, Chronister KJ, Troissi CL, Arafat R, Franzini L: Social and mental health needs assessment of Katrina evacuees. *Disaster Manage Response* 2006;4(3):88–94.
12. Madrid PA, Grant R, Reilly M, Redlener M: Challenges in meeting immediate emotional needs: Short-term impact of a major disaster on children's mental health: Building resiliency in the aftermath of Hurricane Katrina. *Pediatrics* 2006;117(5):S448–S453.
13. Mills MA, Edmondson D, Park CL: Trauma and stress response among hurricane katrina evacuees. *Am J Public Health* 2007;97:S116–S123.
14. Rodriguez SR, Tocco JS, Mallone S, Smithee L, Cathey T, Bradley K: Rapid needs assessment of Hurricane Katrina evacuees—Oklahoma, September 2005. *Prehosp Disaster Med* 2006; 21(6):390–395.
15. Cavey A, Spector J, Ehrhardt D, Kittle T, McNeill M, Greenough PG, Kirsch TD: Mississippi's infectious disease hotline: A surveillance and education model for future natural disasters. *Prehosp Disaster Med* 2009;24(1):11–17.
16. Parker, CL, Barnett, DJ, Everly, GS Jr, Links, JM: Expanding disaster mental health response: A conceptual training framework for public health professionals. *Int J Emerg Ment Health* 2006;8(2):101–109.
17. Slepski LA: Emergency preparedness and professional competency among health care providers during hurricanes Katrina and Rita: Pilot study results. *Disaster Manag Response* 2007;5(4):99–110.
18. CDC: CDC-OCSSO-Advancing the Nation's Health: A Guide to Public Health Research Needs, 2006–2015. Ed. Office of the Chief Science Officer. 19 Dec. 2007. Available at <http://www.cdc.gov/od/science/PHResearch/cdcr/AdvancingTheNationsHealth.pdf>. Accessed 29 February 2008.

# Sheltering the Sheltered: Protecting the Public Health and Educating the Workforce

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Arguably, the majority of worldwide domestic disasters are well-managed by local and regional resources. The health consequences focus on the direct effects of the disaster and rarely, if ever, challenge the workforce to re-focus attention and resources on emerging indirect consequences of mortality and morbidity. That is the case, however, when disasters involve large swaths of geography, dense populations, and the intensity to compromise and expose gaps in the daily protections that the public health infrastructure and system provide.<sup>1</sup> True to form, these latter disasters keep us honest by revealing the state of the public health protections through exposing their vulnerabilities.<sup>2</sup> These vulnerabilities frequently expose gaps in the aging public health infrastructure that is easily overwhelmed or compromised by the event or has suffered budgetary lapses that would have prevented further devastation.<sup>1</sup> Public health emergencies only recently have come to the attention of North American disaster planners who, in the pre-Katrina era, considered themselves safely protected from the health consequences considered to be relegated to disasters in developing countries or prolonged war and conflict. Lulled by denial that those events would impact developed countries, these disasters exposed fundamental deficiencies in planning, preparedness, prevention, and education of the workforce.

Academia's role in the broad humanitarian network is to provide transparency, accountability, and inclusivity to the evidence-based process of disaster investigation. Brahmhatt and her co-authors from Johns Hopkins, Harvard, and Boston Universities, have done us great service in revealing the nuances of this study.<sup>3</sup> It is not surprising that the indirect consequences of an emerging public health emergency would first surface where the most basic elements of human sheltering takes place. How quickly the clues were present for an emerging public health emergency: the breakdown of the public health surveillance and information systems, overcrowding, the displacement of vulnerable populations such as the elderly, and, most critically, an unaware and inadequately trained shelter health staff. Public health awareness and appropriate operative responses in coping with these threats is not instinctive to healthcare workers in North America as they do not reflect realities of everyday healthcare management. Domestic, conventional disasters are handled rapidly without resulting in a public health emergency; this is what we expect, and this is what the current limited funding for preparedness and education and training is required to focus on. This study indicates how difficult it is to recognize and appropriately deal when the public health system and infrastructure is lacking, especially when the numbers and density of the vulnerable populations are massive: a quarter of a million Katrina-displaced remained in shelters for >14 days. Even now, few are aware that the hurricane scattered >2.5 million people throughout the US; a figure representing 10% of the world's 25 million internally displaced people, equivalent to the numbers of displaced in Darfur, and more than the 1.5 million displaced from the Indian Ocean tsunami.<sup>4</sup>

The developed world is spoiled by a public health system that, on a daily basis, copes well with public health surveillance and risk management, such

that when it is absent, providers are neither attuned to the potential consequences nor, as volunteers, trained to know them. We should not be shocked by the findings that less than one-third of shelter health staff had public health training and only 55% had received public health information specific to managing the health needs of evacuees. The shelters served as a microcosm of the general public health system, one that collapsed in New Orleans and did not recover in time to even recognize excess mortality one year post-Hurricane Katrina.<sup>5</sup> The findings of the clinical scenarios support what we already know: we healthcare providers are instinctively good at responding to events requiring direct medical attention, but fall short in all indirect consequence clinical scenarios with epidemic potential and those that require proper notification of public health authorities by shelter health staff.

When we think of the American Red Cross (ARC), we instinctively think of shelters. Indeed, in the early 1900s, the ARC correctly recognized that it is human to seek shelter and company of others when the population is struck with a large-scale disaster; hence, the development of sheltering as a mantra of ARC art and science. What was unexpectedly revealed in the vulnerabilities of this venerable institution is that they too can be lulled into a sense of denial, or possibly were forced to triage their limited resources to other more pressing projects and programs. More accurately, the ARC, like all volunteer organizations, has had to accept the status quo thinking and triage their education and training to what was necessitated by limited

funding and outside support. I know first hand that my ARC colleagues talk enviously of the 'ideal environment' where preparedness and prevention prevail through robust contingency education and training for every possible disaster scenario. As long as funds for staffing and contingency training remain limited, we should not be surprised that shelter staff and technical resources will not be directed toward public health prevention and preparedness in any timely fashion. Of the 79% of shelter staff in the study who reported receiving some formal ARC training, only 48% felt their training was adequate, and less than one-third had any measure of public health instruction. This reality haunts the triage decisions that all voluntary organizations like the ARC, have to endure when chronically suffering marginal resources and funding. They too are no different than the existing governmental public health systems that realized, too late, that a surveillance system made from antiquated paper forms would ever be anything but pulp after a flood of this size.<sup>5</sup> Post-Hurricane Katrina and Rita disasters read like a horror novel with one deficiency building on the next. Even if the shelter staff was well-versed in every possible public health consequence, the broader system and infrastructure was inadequate to meet the surveillance appropriate for those requirements.

The uncomfortable but real question remains whether this study will just languish within an expansive MEDLINE database along with many other similar and revealing studies, or will it come to the attention of decision-makers who have the responsibility to promote and accelerate necessary policy change.

#### References

1. Burkle FM Jr, Greenough PG: Impact of public health emergencies on modern disaster taxonomy. *Disaster Med Public Health Prep* 2008;2(3):192-199.
2. Burkle FM Jr, Rupp G: Hurricane Katrina: Disasters keep us honest. (Commentary). *Monday Developments* 2005;23(17):5.
3. Brahmhatt D, Chan JL, Hsu EB, Mowafi H, Kirsch TD, Quereshi A, Greenough PG: Public health preparedness of post-Katrina and Rita shelter health staff. *Prehosp Disaster Med* 2009;24(6):480-486.
4. Lawry L, Burkle FM Jr: Measuring the true human cost of natural disasters. *Disaster Med Public Health Prep* 2008;2(4):208-210.
5. Stephens KU Sr, Grew D, Chin K, Kadetz P, Greenough PG, Burkle FM Jr, Robinson SL, Franklin ER: Excess mortality in the aftermath of Hurricane Katrina: A preliminary report. *Disaster Med Public Health Prep* 2007;1(1):15-20.