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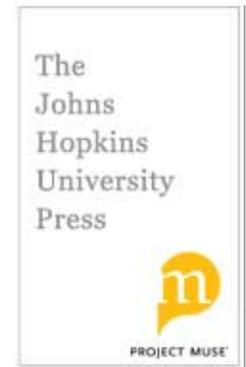
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## Displacement of the Underserved: Medical Needs of Hurricane Katrina Evacuees in West Virginia

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*Abstract:* On August 29, 2005 Hurricane Katrina struck Louisiana, Mississippi, and Alabama. During the aftermath of the storm, hurricane victims were evacuated to over 1,000 evacuation centers in 27 states. Three-hundred and twenty-three evacuees from 220 households were provided housing, food, and medical care at an evacuation center in West Virginia. A needs assessment followed to identify current needs of the evacuees. One-hundred and sixty-four evacuees were interviewed. Twenty-five percent reported an acute illness, while 46% reported having at least one chronic medical condition. The greatest need reported was for dental care (57%), followed by eyeglasses (34%), dentures (28%), and medical services (25%). Two weeks after the hurricane, the basic needs of food, shelter, and hygiene were met. The assessment identified and led to a successful response regarding the ongoing need for durable medical equipment (dentures and eyeglasses), as well as dental care.

*Key words:* Hurricane, needs assessment, evacuees.

*Disclaimer:* The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the National Institute for Occupational Safety and Health or the Centers for Disease Control and Prevention.

On August 29, 2005 Hurricane Katrina made landfall as a Category 4 storm near Buras, Louisiana, 60 miles south of New Orleans.<sup>1</sup> Because Hurricane Katrina was very large, it pushed record storm surges onshore, affecting the entire Mississippi Gulf Coast and parts of Alabama. Unprecedented flooding, particularly in New Orleans and surrounding parishes ensued. As of October 6, 2005, a total of 1,185 Gulf Coast fatalities due to Hurricane Katrina had been confirmed and property damage was

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estimated to be \$200 billion, topping 1992's Hurricane Andrew as the most expensive in the U.S. history.<sup>2</sup>

Hurricane Katrina displaced approximately one million people from the Gulf Coast region.<sup>3</sup> Evacuation centers were established in the affected states as well as neighboring Texas, which sheltered an estimated 250,000 evacuees in the days following the storm.<sup>4</sup> The response ultimately took on a national scope, with over 1,000 evacuation centers in 27 states involved.<sup>5</sup> This paper reports on the experiences at one of those evacuation centers in the state of West Virginia.

West Virginia is a landlocked, mountainous state approximately 1,000 miles from the Gulf Coast. Evacuees arrived in the state capitol of Charleston by air, and then traveled approximately 165 miles by bus to the evacuation center. The evacuation center was established at an Army National Guard Training Site Command with ongoing activities and provided temporary housing for the evacuees. More than 300 evacuees arrived at the evacuation center between September 4–7, 2005. Relief workers at the evacuation center included Red Cross volunteers; local, state, and national public health personnel; and representatives of other community groups. The center was operational until October 1, 2005, at which point all evacuees had, with Red Cross assistance, found alternative housing.

At the center, evacuees were housed in communal barracks by family status, sex, and special needs. The barracks had communal showers, bunk beds, and large lockers. Two Red Cross volunteers per floor monitored the barracks. There were two hand-washing stations (four spigots per station) outside of the mess hall, where meals were served cafeteria-style. Bus service to local shopping centers was provided periodically. West Virginia University (WVU) health care providers established a temporary on-site medical clinic to provide basic diagnostic and therapeutic services, prescription medications, and referrals. The clinic was operational from the time of the evacuees' arrival.

To provide appropriate medical, dental, mental health and social services to the evacuees, the West Virginia Department of Health and Human Resources (WVDHHR) and the U.S. Centers for Disease Control and Prevention (CDC) conducted a medical needs assessment from September 9–12, 2005. The objective was to identify current needs and to coordinate the provision of care and services in collaboration with state and local partners.

## Methods

The WVDHHR requested assistance from the CDC to assess the medical, dental, mental health, and social service needs of evacuees at this center. Two Epidemic Intelligence Service Officers (EISOs) from the National Institute for Occupational Safety and Health (NIOSH) were assigned to collaborate with an EISO stationed at the WVDHHR. Using a CDC surveillance instrument and a WVU medical screening tool, personnel from WVDHHR and the CDC designed a needs assessment and health status questionnaire (see Appendix). The questionnaire covered: 1) acute conditions, including physical symptoms, mental health symptoms, and recent injuries; 2) chronic medical conditions, including prescription medication use and pre-existing disabilities; and 3) current needs. The current needs section of the questionnaire addressed assistive devices,

medical and dental care, and mental health services including assistance with substance abuse problems. On September 9th, the questionnaire was piloted on approximately 5% of the evacuee population. Minor adjustments were made to the questionnaire (such as reordering some of the questions) and the full assessment was conducted on September 10th–12th. The survey team consisted of WVDHHR and CDC personnel and WVU medical students. Survey team members obtained a convenience sample by approaching evacuees outside the mess hall, in the barracks, at a tuberculosis testing station, and at a meeting with the evacuated families and the West Virginia Department of Education. Interviews were conducted individually with the evacuee, or with the evacuee's parent or guardian, if appropriate. Efforts were made to maintain evacuees' confidentiality in communal settings.

The survey team also obtained Red Cross household registration records. These records provided household demographic information: pre-disaster address, dwelling type, dwelling insurance, and total household income range. Information related to the hurricane, such as extent of dwelling damage and anticipated housing needs, was also included. The household information was linked to the questionnaire by the names and ages of household members.

Data were entered into a Microsoft access database by WVDHHR and CDC personnel and analyses were conducted using Epi Info, Version 3.01 (CDC, 2003).

## Results

**Red Cross registration records.** The Red Cross registered a total of 220 households representing all 323 individuals. Sixty-four percent of the evacuees were male (Table 1). Three percent were under 5 years of age and 8% were over 65 years of age. The mean age of the individuals was 40 years (median 44 years), with a range from 1 year to 83 years. Fifty-five percent had lived in a single family home before the storm and 40% had lived in an apartment, while 2% reported having been homeless or living in a homeless

**Table 1.**

### CHARACTERISTICS OF ALL EVACUEES IN WEST VIRGINIA, SEPTEMBER 2005

Characteristic	n	% <sup>a</sup>	95% CI <sup>b</sup>
Sex (n=323)			
Male	207	64	(59–69)
Female	116	36	(31–41)
Age, in years (n=323)			
<5	11	3	(2–6)
5–17	50	16	(12–20)
56–65	42	73	(68–78)
>65	25	8	(5–11)

(Continued on p. 372)

**Table 1. (continued)**

Characteristic	n	% <sup>a</sup>	95% CI <sup>b</sup>
Type of housing (n=209)			
Apartment	83	40	(33–47)
Homeless	2	1	(0–3)
Homeless shelter	3	1	(0–4)
Hotel	1	1	(0–3)
Mobile home	6	3	(1–6)
Single	114	55	(48–61)
Ownership (n=203)			
N/A	4	2	(1–5)
Own	47	23	(18–30)
Rent furnished	61	30	(24–37)
Rent unfurnished	91	45	(38–52)
Housing damage (n=203)			
Destroyed	122	60	(53–67)
Major	49	24	(18–31)
Minor	10	5	(2–9)
Unknown	22	11	(7–16)
Estimated housing needs (n=201)			
None	1	1	(0–3)
Permanent	149	74	(68–80)
Temporary	47	23	(18–30)
Unknown	4	2	(1–5)
Structural insurance (n=180)			
No	156	87	(81–91)
Yes	24	13	(8–19)
Contents insurance (n=176)			
No	159	90	(85–94)
Yes	17	10	(6–15)
Income range (n=181)			
\$0–7,499	73	40	(33–48)
\$7,500–9,999	19	11	(6–16)
\$10,000–14,999	34	19	(13–25)
\$15,000–24,999	25	14	(9–20)
\$25,000–34,999	16	9	(5–14)
\$35,000 and over	14	8	(4–13)

<sup>a</sup>Percentages may not add to 100 because of rounding.

<sup>b</sup>Confidence interval.

shelter. Twenty-three percent owned their dwellings, while 75% rented. Eighty-four percent suffered major damage or complete destruction of their property. Eighty-seven percent did not have insurance for the dwelling itself and 90% did not have insurance for its contents. Forty percent reported a yearly household income less than \$7,500 and 44% reported a household income between \$7,500 and \$25,000.

**WVDHHR and CDC needs assessment.** A total of 164 people, or 51% of all evacuees at the center, participated in the assessment (Table 2). Sex and age distributions of respondents were similar to those of all center evacuees. Eighty-one percent were African American and 16% were Caucasian. Twenty-five percent reported an acute

**Table 2.**

**DEMOGRAPHICS AND RESULTS OF MEDICAL NEEDS ASSESSMENT—WEST VIRGINIA, SEPTEMBER 2005 (N=164)**

Characteristic (N=164)	n	%	95% CI <sup>a</sup>
Gender (N=164)			
Male	109	67	(59–74)
Female	55	34	(26–41)
Age, in years (N=164)			
<5	2	1	(0–4)
5–17	26	16	(11–22)
18–65	119	73	(65–79)
>65	17	10	(6–16)
Race (N=160)			
African American	129	81	(74–86)
Asian/Pacific Islander	4	3	(1–6)
Multi-racial	1	1	(0–3)
White	26	16	(11–23)
<b>Medical needs assessment</b>			
Acute illness	41	25	(19–32)
Chronic medical conditions	76	46	(39–54)
Taking prescription medications	77	47	(39–55)
Mental health conditions	65	40	(32–48)
Anxiety/depression	46	28	(21–36)
Insomnia	38	23	(17–30)
Use street drugs/alcohol	17	10	(6–16)
Thoughts of harming self	3	2	(0–5)
Thoughts of harming others	5	3	(1–7)
Recent injury	22	13	(9–20)
Physical disabilities	15	9	(5–15)

<sup>a</sup>Confidence interval.

illness and 46% reported having at least one chronic medical condition. Almost half (47%) were taking prescription medication. Forty percent reported a mental health symptom. Twenty-eight percent reported being anxious or depressed, while almost a quarter (23%) reported experiencing insomnia. Ten percent reported using street drugs or alcohol. Five percent had thoughts of harming themselves or others. Thirteen percent had a recent injury. Nine percent reported having a physical disability.

Dental care was the most commonly reported current medical need, at 57%, followed by eyeglasses (34%), dentures (28%), and medical services (25%) (Table 3). Thirteen percent reported needing counseling or psychotherapy.

## Discussion

The challenges facing the public health community in the wake of Hurricane Katrina were immense. The Gulf Coast infrastructure was damaged and in many cases destroyed, leaving thousands of people without access to basic necessities (food, clean water, sanitation, and shelter). Under such conditions, evacuees are at risk for infectious diseases, including respiratory and gastrointestinal illnesses.<sup>3,6-7</sup> Injuries (including lacerations, punctures, and animal bites) are also a concern in natural disasters, and wounds can become infected, at times with exotic organisms.<sup>8-9</sup> While epidemics following natural disasters are rare,<sup>10</sup> the prompt provision of medical services, restoration of hygiene, and alleviation of crowding are first steps to avert the spread of communicable diseases. The evacuation center in West Virginia provided a medical clinic capable of diagnosing

**Table 3.**

### RESULTS OF NEEDS ASSESSMENT—WEST VIRGINIA, SEPTEMBER 2005 (N=164)

Most common current needs	n	%	95% CI <sup>a</sup>
Dental care	93	57	(49–64)
Eyeglasses	56	34	(27–42)
Dentures	46	28	(21–36)
Medical services	41	25	(19–32)
Smoking cessation	23	14	(9–20)
Counseling/psychotherapy	22	13	(9–20)
Hearing aid	9	6	(3–10)
Assistance with alcohol/drug issues	6	4	(1–8)
Cane	6	4	(1–8)
Family planning	4	2	(1–6)
Wheelchair	3	2	(0–5)
Walker	2	1	(0–4)
Interpretive needs	1	1	(0–3)

<sup>a</sup>Confidence interval.

and treating infectious conditions; full sanitary services, including showering facilities and hand wash stations outside the cafeteria; three hot meals per day; and adequate, clean (though not private) housing units. While, initially, treatment and prevention of infectious diseases were health priorities at the center, the assessment highlighted a prevalence of chronic conditions and acute mental health symptoms of even greater concern. Almost half of the respondents had a chronic medical condition and required prescription medications, and a substantial number had a physical disability. Unexpectedly high proportions of the respondents reported needing durable medical equipment, such as dentures and eyeglasses, as well as dental care (both emergent and non-emergent). A large number endorsed mental health symptoms and requested counseling services. Thus the assessment permitted an evaluation of the current needs of the evacuees two weeks after the hurricane. We concluded that:

- The medical clinic should continue to provide care for chronic medical conditions, including prescription medication, and make referrals to local hospitals as appropriate.
- Dental services should continue for emergent conditions, and should be expanded to include non-emergent care.
- Arrangements should be made for evacuees to be evaluated and fitted for dentures and eyeglasses.
- Relief workers should continue to provide mental health services, including counseling, and make referrals for psychiatric care, as appropriate.

Relief workers responded by procuring the services needed. The medical clinic continued to operate on a full-time basis until September 18th, serving 20 to 25 evacuees per day, and then on a part-time schedule, serving 10 to 15 evacuees per day. The WVU Dental School was available for urgent dental care needs and a private oral surgeon provided dental services to 4 individuals. In addition, a nationwide denture provider offered one-day service for dentures. The local Lions Club came to the center and screened individuals for eyeglasses. A local eyeglass provider and eye doctor provided services to people who needed eyeglasses. These services were provided free of charge. Counseling was provided by trained Red Cross volunteers, and a referral system with nearby hospitals was established for acute psychiatric care.

The evacuees describing mental health symptoms highlight a common experience of survivors of natural disasters.<sup>11-12</sup> Grief reactions to loss of life and property and anxiety about the future can lead to symptoms of depression (tearfulness, apathy, and change in sleep patterns) in the days and weeks following a disaster. The aftermath of a natural disaster can also bring traumatic experiences with mental health sequelae. Reports of violence following the flooding in New Orleans, for instance, circulated in the press and were anecdotally reported by the evacuees. One mother described her 6 year old son's mental state upon arriving at the evacuation center this way: "He won't let me out of his sight. He is worried by soldiers." While the majority of such symptoms can be expected to remit with time, some represent exacerbations of pre-existing mental health conditions and others are likely to progress to chronic post-traumatic disorders.<sup>11</sup> The inclusion of mental health services in the public health response to disasters has many advocates,<sup>13-14</sup> though some have expressed concerns about the

potential risks of iatrogenic harm.<sup>15</sup> Follow-up of Katrina survivors who did and did not receive mental health services will be necessary to assess the long-term effectiveness of such interventions.

The needs for dental care and dentures were particularly prevalent among the evacuees. While some of these needs related directly to the disaster, such as dentures lost or left behind, others reflected poor dental health that predated the hurricane. An analysis of the National Health and Nutrition Examination Survey (NHANES III) limited to African Americans found that dental health was worse for those individuals who were poor, unemployed, and uninsured than for their counterparts; furthermore, those living in the South of the U.S. reported poorer dental health than those living elsewhere.<sup>16</sup> Other studies have confirmed such racial and socioeconomic disparities.<sup>17-18</sup> Poor dental health can negatively affect nutrition, is linked to some chronic diseases, and affects self-esteem and appearance.<sup>19</sup> The evacuees at the center in West Virginia were from some of the areas of New Orleans hardest hit by Hurricane Katrina. Many would not be able to return to their homes and jobs for months, if not longer, and would have to seek housing, employment, and a social support system in a new location. Like any chronic disease with external manifestations, poor dental health could complicate their reintegration. Thus dental health care needs were an unexpected but important target for intervention at this center and should be considered in future disasters.

There were several limitations to our assessment. It relied on self-reporting both for household and health information, which may have introduced a recall bias for some questions. People with current health concerns may have been more likely to participate in the health assessment than those without such concerns, leading to overrepresentation. The assessment was obtained from a convenience sample so the results cannot be generalized to other evacuees. If any individuals had medical conditions of a sensitive nature (such as HIV), they may have avoided the assessment due to concerns about confidentiality. While efforts were made to include the less mobile by visiting their living quarters within the barracks, this group also may have been underrepresented. Only half of the evacuees participated in the needs assessment, which may reflect "questionnaire-fatigue" on the part of evacuees following the detailed registration process, as well as reluctance to discuss the harrowing disaster they had so recently experienced.

Public health personnel have successfully conducted needs assessments to evaluate the health status and immediate needs of communities following hurricanes,<sup>20-23</sup> a tropical storm,<sup>24</sup> and an ice storm.<sup>25</sup> Conducting an assessment soon after the evacuees arrived at the center in West Virginia was critical for evaluating the health status and needs of the evacuees. The data obtained from the needs assessment were used by decision-makers to direct response activities, and provide appropriate services to this population during their stay at this evacuation center in West Virginia.

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## Appendix

Family Name \_\_\_\_\_

Last Name, First Name (Head of Household) \_\_\_\_\_

### MEDICAL NEEDS ASSESSMENT:

Last Name \_\_\_\_\_ First Name \_\_\_\_\_

Date of Birth \_\_\_\_/\_\_\_\_/\_\_\_\_

Gender: \_\_\_ Male \_\_\_ Female

Race: \_\_\_ Asian/Pacific Islander

\_\_\_ African-American

\_\_\_ White

\_\_\_ MultiRacial

\_\_\_ Unknown

City of Permanent Residence \_\_\_\_\_ State of Permanent Residence \_\_\_\_\_

#### ***PART I—Acute Conditions***

Do you feel ill or sick today? Yes/No  
If no, skip to PART II.

Gastrointestinal illness (gut problems) Yes/No  
Watery diarrhea/runs Yes/No  
Bloody diarrhea/runs Yes/No  
Vomiting/throw-up Yes/No  
Other, specify \_\_\_\_\_

Respiratory illness (breathing problems)  
Upper respiratory tract infection (cold, runny nose) Yes/No  
Influenza-like illness (fever and cough or sore throat) Yes/No  
Lower respiratory tract illness (pneumonia) Yes/No  
Tuberculosis (TB), suspected Yes/No  
Pertussis (whooping cough), suspected Yes/No  
Other, specify \_\_\_\_\_

Dehydration Yes/No

Heat related injury (heat exhaustion, heatstroke) Yes/No

Neurologic illness Yes/No  
Meningitis/encephalitis, suspected (stiff neck, headache) Yes/No  
Disorientation/confusion Yes/No  
Other, specify \_\_\_\_\_

Dermatologic (skin problems) condition	Yes/No
Varicella (chickenpox), suspected	Yes/No
Rubella (German measles)/measles, suspected	Yes/No
Scabies (bugs, "the itch")	Yes/No
Rash, acute onset + fever	Yes/No
Other, specify _____	
Other infectious disease condition	Yes/No
Fever >100.4° F (38°C) ALONE without localizing signs	Yes/No
Jaundice (viral hepatitis, suspected)	Yes/No
Lice	Yes/No
Wound infection, specify site	Yes/No
Conjunctivitis (red eyes, gunk in eyes)	Yes/No
Other, specify _____	

### ***PART II—Chronic and Other Conditions***

Are you pregnant?	Yes/No
# weeks _____ or #months _____	
Chronic (ongoing, long term) medical conditions	Yes/No
Do you have any heart disease/high blood pressure?	Yes/No
Hypertension (high blood pressure)	Yes/No
Other, specify _____	
Do you have any lung disease?	Yes/No
COPD/emphysema	Yes/No
Asthma	Yes/No
Other, specify _____	
Do you have any kidney disease?	Yes/No
Dialysis dependent	Yes/No
Other, specify _____	
Do you have diabetes?	Yes/No
Insulin	Yes/No
Oral medication	Yes/No
Other, specify _____	
Do you have problems with your immune system?	Yes/No
Cancer	Yes/No
HIV/AIDS	Yes/No
Hepatitis B or C	Yes/No
Chronic or high dose steroid use	Yes/No
Other, specify _____	
Do you have any neurological problems?	Yes/No
Stroke/paralysis	Yes/No
MS (multiple sclerosis)	Yes/No
Other, specify _____	

Do you have any problems with your blood?	Yes/No
Sickle-cell anemia	Yes/No
Hemophilia	Yes/No
Requires blood products	Yes/No
Other, specify _____	
Known allergies (medications, food, seasonal), specify _____	
Are you taking any prescription medications?	Yes/No
Do you have any disabilities?	Yes/No
Physical disabilities	Yes/No
Mobility impairment (wheelchair, walker, etc.)	Yes/No
Other, specify _____	
Sensory disability	Yes/No
Visually impaired (blindness, limited vision)	Yes/No
Hearing impaired	Yes/No
Other, specify _____	
Cognitive disability (learning problems)	Yes/No
Mental retardation	Yes/No
Autism	Yes/No
Attention Deficit Hyperactivity Disorder (ADHD)	Yes/No
Other, specify _____	
Resided in a group home, nursing home or assisted care facility	Yes/No
Other, specify _____	
Mental health condition (nerves)	Yes/No
Anxiety/depression	Yes/No
Trouble sleeping?	Yes/No
Use street drugs/alcohol dependence/withdrawal	Yes/No
Thoughts of harming yourself?	Yes/No
Thoughts of harming others?	Yes/No
Other, specify _____	
A recent injury?	Yes/No
Self-inflicted injury—intentional (violence)	Yes/No
Assault-related injury—intentional (violence)	Yes/No
Unintentional injury (accidents)	Yes/No
Other, specify _____	
What insurance and other assistance were you on at the time of the hurricane?	
Medicaid	Yes/No
Medicare	Yes/No
Private insurance	Yes/No
Worker's Comp	Yes/No
Veteran assistance	Yes/No
Other, specify _____	

Do you need any of the following or are you currently using?	Currently Using	Need
Cane	Yes/No	Yes/No
Walker	Yes/No	Yes/No
Seeing eye dog	Yes/No	Yes/No
Hearing aid	Yes/No	Yes/No
Wheelchair	Yes/No	Yes/No
Eyeglasses	Yes/No	Yes/No
Dentures	Yes/No	Yes/No
Dental care	Yes/No	Yes/No
Interpretive needs (signing or translation services)	Yes/No	Yes/No
Family planning services	Yes/No	Yes/No
Medical services	Yes/No	Yes/No
Counseling/psychotherapy	Yes/No	Yes/No
Assistance with alcohol or drug issues	Yes/No	Yes/No
Smoking cessation	Yes/No	Yes/No
Other, specify _____		

Date of Questionnaire: 09/ /2005 Interviewer initials: \_\_\_\_\_

## Notes

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