

# RESEARCH

## Characteristics of Physician Relocation Following Hurricane Katrina

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### ABSTRACT

**Introduction:** On August 29, 2005, Hurricane Katrina made landfall along the US Gulf Coast, resulting in the evacuation of >1.5 million people, including nearly 6000 physicians. This article examines the relocation patterns of physicians following the storm, determines the impact that the disaster had on their lives and practices, and identifies lessons learned.

**Methods:** An Internet-based survey was conducted among licensed physicians reporting addresses within Federal Emergency Management Agency–designated disaster zones in Louisiana and Mississippi. Descriptive data analysis was used to describe respondent characteristics. Multivariate logistic regression was performed to identify the factors associated with physician nonreturn to original practice. For those remaining relocated out of state, bivariate analysis with  $\chi^2$  or Fisher exact test was used to determine factors associated with plans to return to original practice.

**Results:** A total of 312 eligible responses were collected. Among disaster zone respondents, 85.6% lived in Louisiana and 14.4% resided in Mississippi before the hurricane struck. By spring 2006, 75.6% (n = 236) of the respondents had returned to their original homes, whereas 24.4% (n = 76) remained displaced. Factors associated with nonreturn to original employment included family or general medicine practice (OR 0.42, 95% CI 0.17–1.04;  $P = .059$ ) and severe or complete damage to the workplace (OR 0.24, 95% CI 0.13–0.42;  $P < .001$ ).

**Conclusions:** A sizeable proportion of physicians remain displaced after Hurricane Katrina, along with a lasting decrease in the number of physicians serving in the areas affected by the disaster. Programs designed to address identified physician needs in the aftermath of the storm may give confidence to displaced physicians to return. (*Disaster Med Public Health Preparedness*. 2007;1:21–26)

**Key Words:** physician, disaster, hurricane, displacement

On August 29, 2005 Hurricane Katrina made landfall along the US Gulf Coast, leaving devastation in its wake. At least 1808 deaths were attributed to the storm and subsequent flooding in Louisiana and Mississippi.<sup>1</sup> With total damage estimates exceeding US\$100 billion, Hurricane Katrina emerged as the costliest natural disaster in US history.<sup>2</sup> The scale of societal impact was likewise unprecedented, with more than 1.5 million people requiring evacuation.<sup>1</sup> Nearly 2 years after the storm, more than 200,000 residents remain displaced from their homes in the hardest-hit areas.<sup>3</sup>

In the aftermath of Hurricane Katrina, health care infrastructure and services sustained extensive disruption. Flooding in New Orleans forced a temporary shutdown of health care delivery in several parishes and led to the displacement of many local physicians from the region. By autumn 2005 nearly 6000 physicians had been displaced from the Gulf region by Hurricane Katrina. Louisiana was most severely affected; among displaced physicians, 4486 had for-

merly practiced in 3 New Orleans parishes (Orleans, Plaquemines, and St. Bernard).<sup>4</sup> According to Government Accountability Office statistics, only 3 of the 9 hospitals in Orleans Parish had reopened by February 2006, with a total bed capacity reduced to approximately 20% of that before the storm.<sup>5</sup> Among the state's largest public hospitals, Charity Hospital still remains closed, whereas University Hospital reopened in November 2006 with limited capacity.

A major aspect of health care system recovery relates to whether displaced physicians have returned, intend to return, or have permanently relocated their practice. Such decisions are likely to have a direct and profound effect on the long-term reconstitution of regional health care systems in the Gulf region; however, trends of physician displacement following Hurricane Katrina have not been reported in detail. The present study sought to investigate whether Hurricane Katrina has resulted in a significant loss of practicing physicians from disaster-stricken regions of the Gulf Coast. The authors examine the relocation

patterns of local physicians following Hurricane Katrina, determine how the disaster affected their lives and practice, and identify lessons learned that can guide health care recovery efforts in future events.

## METHODS

### Survey Design

A descriptive Internet-based survey was developed to investigate physician demographics and relocation patterns following Hurricane Katrina. The survey was jointly designed by the study team at the American Medical Association (AMA) Center for Public Health Preparedness and Disaster Response and the Tulane University School of Public Health & Tropical Medicine. A total of 46 questions addressed physician demographics, the magnitude of the storm's impact on personal and professional lives, and relocation status. Relocation was defined as residing at a different location from that before Hurricane Katrina. As part of the design process, the form and content of the survey were reviewed by board members of the Louisiana State Medical Society. Pilot testing was conducted with selected local physicians.

### Selection of Study Participants

Survey participants were identified and selected from an AMA master file of all of the licensed physicians reporting addresses located within Federal Emergency Management Agency (FEMA)-designated disaster zones in Louisiana and Mississippi before August 2005. Corresponding e-mail addresses for potential survey participants were obtained from the 2006 Record of Physician Professional Activities. Physicians residing outside FEMA-designated disaster zones before the hurricane, those without a listed e-mail address, and those for whom the listed e-mail address was undeliverable were excluded from the study.

### Survey Administration

The survey was administered online by the AMA during spring 2006. Eligible participants were sent introductory letters via e-mail describing the purpose of the study with a link to the Internet-based survey. The survey was accessible during the period March 9, 2006–July 10, 2006. To enhance the response rate, announcements of the study and survey availability were made on local, state, and national medical society listservs and local medical society newsletters.

To verify that potential respondents met study criteria, entry of a pre-Katrina home ZIPcode from participating physicians was required. ZIPcode entries were automatically screened by the program so that the questionnaire could be accessed only when the ZIPcode entered by a respondent matched a FEMA-designated disaster zone. For physicians requiring further assistance or

clarification, a telephone number directing respondents to contact the study coordinators was provided on the Web site.

### Data Analysis

Descriptive data analysis was used to describe characteristics of respondents by calculating the proportions for categorical variables. Multivariate logistic regression was performed to identify the factors associated with physician nonreturn to original practice. For those remaining relocated out of state at the time of the survey, bivariate analysis using  $\chi^2$  or Fisher exact test was performed to determine factors associated with plans to return to original practice.  $P < .05$  was considered statistically significant. SAS version 9.1 (SAS Institute, Cary, NC) was used to perform all of the data analyses.

## RESULTS

Based on reported ZIPcodes, the AMA master file identified 5854 physicians (AMA members and nonmembers) who resided in the FEMA-designated disaster zones before August 2005. E-mail addresses were obtained for a total of 1266 (21.6%) of the identified physicians, of which 976 (77.0%) were active and 290 (23.0%) were returned as undeliverable. A total of 312 eligible responses were collected, yielding a response rate of 32.0% from contacted physicians who originally resided in the areas of interest, which represented 5.3% of the total affected physician population. A comparison of respondents versus nonrespondents revealed no statistically significant differences based on sex, specialty, board certification, AMA membership or other identifiable characteristics, apart from age (86.6% respondents >40 years old vs 79.6% nonrespondents >40 years old).

### Demographics

Among disaster zone respondents, 85.6% lived in Louisiana and 14.4% resided in Mississippi before Hurricane Katrina (Table 1). Approximately 80% of the physicians were men; a similar percentage reported being married, and 47.1% had children <18 years old living at home. Physicians ages 50 to 59 comprised the largest age group. More than half of all of the respondents had >20 years of medical experience. At least 67.3% had practiced in-state for >10 years, with 37.8% practicing in-state for >20 years. By specialty, 8.3% of all respondents designated themselves as family practice or general medicine practitioners.

### Relocation Status

By spring 2006, 75.6% ( $n = 236$ ) of the respondents had returned to their original homes, whereas 24.4% ( $n = 76$ ) reported a different place of residence (Table 2). Of those who remained displaced from their homes, 39.5% ( $n = 30$ ) had temporarily relocated to another home within the same state, 19.7% ( $n = 15$ ) had permanently relocated to another

“...programs to address identified physician needs in the aftermath of the storm may give confidence to displaced physicians to return”

TABLE 1

Sociodemographic Characteristics of Respondents (n = 312)

Characteristic	n (%)	Characteristic	n (%)
Sex		State of residence	
Male	248 (79.5)	Louisiana	267 (85.6)
Female	64 (20.5)	Mississippi	45 (14.4)
Marital status		Years practiced in state	
Married	251 (80.5)	<10	89 (28.5)
Single	27 (8.7)	11–20	92 (29.5)
Divorced	20 (6.4)	>20	118 (37.8)
Partnered	10 (3.2)	Retired	7 (2.2)
Widowed	4 (1.3)	Unknown	6 (1.9)
Age, y		Total years in practice	
30–39	47 (15.1)	<10	58 (18.6)
40–49	77 (24.7)	11–20	80 (25.6)
50–59	112 (35.9)	>20	163 (52.2)
≥60	76 (24.4)	Retired	6 (1.9)
Children (<18 y) in home		Unknown	5 (1.6)
Yes	147 (47.1)	Specialty	
No	164 (52.6)	Family/general medicine	26 (8.3)
Unknown	1 (0.3)	Other	286 (91.7)

home in the same state, 27.6% (n = 21) had temporarily relocated out of state, and 13.2% (n = 10) had permanently relocated out of state. At the time of the survey, 40.7% (n = 127) of physicians reported that the hospital with which they were primarily affiliated was closed as a result of the hurricane. Hospital closures disproportionately affected physicians who remained displaced ( $P = .058$ ). For 19.6% (n = 61) of physicians who required new hospital privileges, the process ranged from “very easy” (29.5%), “easy” (34.4%), “difficult” (14.8%), to “very difficult” (19.7%). Physicians relocated out of state were significantly more likely than those who had returned home to characterize the process of acquiring new hospital privileges as “very difficult” ( $P = .017$ ).

### Reported Damage

Reported damages to homes and workplaces are shown in Table 3. Virtually all of the physicians surveyed reported some level of damage to their homes, with 37.1% citing damages ranging from \$10,000 to \$50,000 and 39.7% reporting damages in excess of \$50,000. At the workplace, most physicians sustained damages ranging from minimal to severe, with 45.2% citing business losses in excess of \$50,000.

TABLE 2

Relocation Status of Survey Respondents (n = 312)

Post-Katrina Residence	n (%)
Returned to home	236 (75.6)
Different place of residence	76 (24.4)
Temporarily relocated in same state	30 (9.6)
Permanently relocated in same state	15 (4.8)
Temporarily relocated out of state	21 (6.7)
Permanently relocated out of state	10 (3.2)

### Decision to Return

At the time of the survey, 24.4% (n = 76) of the respondents remained displaced. Of the physicians who had temporarily or permanently relocated either in-state or out of state, 90.8% reported continuing to practice medicine. For all of the respondents, factors associated with nonreturn to original employment included family or general medicine practice (odds ratio [OR] 0.42, 95% confidence interval [CI] 0.17–1.04;  $P = .059$ ) and severe or complete damage to the workplace (OR 0.24, 95% CI 0.13–0.42;  $P < .001$ ) (Table 4).

Among physicians remaining displaced from their home state (n = 31), 41.9% planned to return to their original practice location, 32.3% did not plan to return, and 25.8% remained uncertain regarding future plans. In this group, physicians who were female ( $P < .01$ ), <40 years of age ( $P = .058$ ), and had practiced <10 years in state ( $P = .032$ ) were found to be significantly less likely to return to their original practice.

### Requested Assistance Priorities of Displaced Physicians

The priorities identified by respondents included financial assistance/grants to rebuild their practice (15.7%), financial assistance to rebuild their home (14.7%), information or assistance in obtaining staff for their practice (9.3%), assistance in finding employment (5.1%), information or assistance with obtaining a new medical license (4.8%), assistance with damaged medical records (3.8%), assistance communicating their current practice situation to their former patients (1.9%), and information about or assistance with obtaining medical liability insurance (1.3%).

### DISCUSSION

Although a large number of Gulf Coast physicians have returned to the region, the deep impact of Hurricane Katrina

**TABLE 3**

Damage to Home and Workplace	
Characteristics	n (%)
Damage to home	
Level of damage to home	
No damage	17 (5.5)
Minimal damage	176 (56.4)
Severe damage	97 (31.1)
Complete destruction	22 (7.1)
Estimated personal property losses	
<\$1000	7 (2.2)
\$1000-\$4999	23 (7.4)
\$5000-\$9999	39 (12.5)
\$10,000-\$50,000	99 (31.7)
>\$50,000	124 (39.7)
Don't know	20 (6.4)
Damage to workplace	
Level of damage to workplace	
No damage	30 (9.6)
Minimal damage	153 (49.1)
Severe damage	103 (33.0)
Complete destruction	26 (8.3)
Estimated business losses	
<\$1000	15 (4.8)
\$1000-\$4999	6 (1.9)
\$5000-\$9999	17 (5.4)
\$10,000-\$50,000	64 (20.5)
>\$50,000	141 (45.2)
Don't know	69 (22.1)
Damage to building	269 (86.2)
Damage to medical records	88 (28.2)
Damage to medical equipment	129 (41.3)
Damage to medical supplies	133 (42.6)
Damage to office equipment	135 (43.3)
Damage to office supplies	126 (40.4)

on the local health care systems spawned by physical damage, physician relocation, and disruption of medical services is still being felt. Most displaced physicians were from Louisiana (85.6%), with a smaller segment from Mississippi (14.4%). Approximately 25% of all physician respondents indicated that they remained displaced at the time of the survey, >6 months after the hurricane. Nearly 10% remained out of state, with the preponderance of this group indicating that they were either unlikely to or uncertain about returning to their original practice. These findings of marked physician displacement and attrition in the hurricane-stricken Gulf Coast region are supported by other reports. As of July 2006 Blue Cross Blue Shield reported the number of physicians filing claims in the affected parishes in New Orleans as having been reduced to 48% of pre-Katrina levels, down from 3091 to 1502.<sup>6</sup> In this study family and general medicine practice were found to be associated with nonreturn to original employment. These findings may support the contention that primary care services in disaster areas have been disproportionately affected. In Louisiana a State Board of Medical Examiners review found that the number of board-licensed

primary care physicians in New Orleans fell by 28%, from 2645 to 1913 during the period August 2005–July 2006.<sup>7</sup>

Among physicians remaining displaced out of state, female physicians, younger practitioners, and those who had practiced in-state for a few number of years appear less likely to return or express less certainty about returning to their original practice. The absence of key support sources, such as childcare services or extended family, in the disaster stricken areas may have contributed to a disinclination to return.

Physicians as a group sustained considerable personal and business-related financial losses. As expected, physicians whose homes were significantly damaged or destroyed were far more likely to be displaced at the time of the survey. Approximately 24% of those still relocated 6 months after the disaster reported complete destruction of their homes, and nearly 40% of this same group reported personal losses >\$50,000. Interestingly, severe or complete damage to homes was not associated with nonreturn to original employment; however, physicians who had not returned were significantly more likely to report severe or complete damage to their workplace. Academic hospital centers were not spared. In January 2006 approximately 180 faculty were laid off from Tulane Medical School.<sup>8</sup> In December 2006 Louisiana State University Health Science Center laid off 127 medical school faculty.<sup>9</sup> As expected, hospital closures and downsizing had a major effect on local physicians.

This study has several important limitations. Attempts to trace displaced physicians in the aftermath of the storm presented a unique challenge. Given post-Katrina conditions, the study design team believed that an online survey would yield higher response rates than other data collection methods (eg, mail or telephone surveys). The total number of physician respondents represents a relatively small, although important cross-sectional sample of those affected by Hurricane Katrina (5.3%). Other physicians who may have been affected may not have been captured in the survey, such as those who lived outside but worked in designated FEMA disaster zones.

Although e-mail contact information was available for roughly only 1 in 5 physicians, no clear characteristics distinguished physicians who had provided this information to

**TABLE 4**

Factors Associated With Nonreturn to Original Practice		
Categories	ORs (95% CI)	P
Specialty		
Family/general medicine	0.42 (0.17–1.04)	.059
Others	1.00	
Damage to workplace		
Severe or complete	0.24 (0.13–0.42)	<.001
None or minimal	1.00	

professional societies from those who had not. Reasons for nonparticipation may include expired records, disrupted Internet service, or insufficient time or interest on the part of those surveyed. Nonresponse bias is unlikely to affect the general conclusions of this study because an analysis of respondents and nonrespondents revealed only a modest difference in average age. Of note, this study probably underestimates overall relocation rates because physicians with undeliverable e-mail addresses and those who did not respond to the survey are more likely to have remained displaced. Estimates of reported damage to homes and workplaces are subjective and were not quantified. Physicians who were part of large practice groups or served on hospital staff would not necessarily be expected to reliably estimate workplace damages.

The principal importance of the findings is the cascade effect on health system recovery for every physician who opts not to return to his or her original practice. Patients requiring health care services are forced to seek care from a smaller pool of local providers and primary care practitioners, whereas other health care personnel originally employed by private practices that shut down must also relocate. Even the return of physicians to their original practice does not guarantee the complete restoration of medical services to pre-Katrina levels.

Reports of the personal and professional experiences of physicians affected by Hurricane Katrina offer some insights into the specific recovery needs of health care personnel. Many physicians reported obstacles such as strained living conditions, loss of housing, or difficulties with travel. Others cited numerous operational challenges including the relocation of former practice partners, shortage of cash to maintain operations, difficulty in retaining staff, and burden of treating increasing numbers of uninsured patients.

Several strategies that may facilitate the return of displaced physicians following future natural disasters are suggested by these findings. One of the highest priorities identified by respondents was financial assistance to rebuild their practices. Because severe or complete damage to the workplace was associated with nonreturn, strong financial support incentives must be quickly established to promote the return of practicing physicians. For instance, consideration should be given to policies and programs that would provide immediate low interest loans or grants for rebuilding physician practices. These measures would aid struggling practices and support the reestablishment of health care in heavily affected areas.

Second, a disproportionate loss of primary care providers, including family and general medicine practitioners from

designated disaster areas, must be addressed. Although comparative displacement data for the general population in the designated disaster areas are not readily available for the study period, specific incentives to attract the return of primary care providers to return should be considered. A number of studies point to sharp increases in the number of uninsured or those who had lost access to insurance records following the storm.<sup>10</sup> Along these lines, health care services for underserved populations should be prioritized to receive direct support to address the increased burden that uninsured patients impose on financially weakened medical practices. Programs that offer appropriate reimbursement to physicians for providing care to indigent and uninsured patients should be established as a standard protocol to assist in health care system recovery.

Third, the federal government has opened discussions regarding new grants and loans specifically earmarked for health and medical recovery, lack of access to the uncompensated care pool to those providing care, and bridge funding for health and medical staff salaries and operational costs with disaster-specific loans and grants.<sup>11</sup> Despite such measures, important financial constraints continue to impede the long-term health care system recovery. In response to future disasters, these types of initiatives must be expeditiously implemented.

In conclusion, this study identified a sizeable proportion of physicians who remain displaced following Hurricane Katrina as well as a lasting decrease in the number of physicians serving in the areas affected by the disaster. This, in turn, has broad implications for the long-term health care system recovery of the Gulf Coast. A comprehensive,

regularly updated electronic contact list for physicians would assist representative organizations in monitoring physician relocation patterns, identifying information needs, and offering local support services to physicians. Although the plans elicited from respondents are subject to change based on many factors as the Gulf Coast recovery progresses, programs to address identified physician needs in the aftermath of the storm may give confidence to displaced physicians to return. Additional follow-up assessments may be useful in determining whether the identified patterns of physician relocation persist or change over time.

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### REFERENCES

1. Weisler RH, Barbee JG, Townsend MH. Mental health and recovery in the Gulf Coast after Hurricanes Katrina and Rita. *JAMA*. 2006;296:585–588.
2. Nates JL, Moyer VA. Lessons from Hurricane Katrina, tsunamis, and other disasters. *Lancet*. 2005;366 (9492):1144–1146.
3. Louisiana Healthcare Redesign Collaborative Region 1 Health Care Profile: A Review of Health Care Workforce and Services in Orleans, Jefferson, Plaquemines and St. Bernard Parishes Post Hurricane Katrina. <http://www.dhh.louisiana.gov/offices/publications/pubs-288/Region%201%20Profile.pdf>. Accessed May 14, 2007. For more information contact Kristy Nichols, Louisiana Department of Health and Hospitals Staff, [knichols@ddh.la.gov](mailto:knichols@ddh.la.gov) or 225-342-3814.
4. Williamson D. Study shows Hurricane Katrina affected 20,000 physicians, up to 6,000 may have been displaced. University of North Carolina at Chapel Hill Web site. September 15, 2005. <http://www.unc.edu/news/archives/sep05/fricketts092605.htm>. Accessed February 17, 2007.
5. Hurricane Katrina: Status of the Health Care System in New Orleans and Difficult Decisions Related to Efforts to Rebuild It Approximately 6 Months After Hurricane Katrina (GAO-06-576R). Government Accountability Office Web site. March 28, 2006. <http://www.gao.gov/new.items/d06576r.pdf>. Accessed February 2, 2007.
6. Nichols K. Louisiana Healthcare Redesign Collaborative, Region 1 Health Care Profile: An Assessment of Health Care Workforce and Services in Orleans, Jefferson, Plaquemines and St. Bernard Parishes. Louisiana Department of Health and Hospitals Web site. <http://www.dhh.state.la.us/offices/miscdocs>. Accessed February 26, 2007.
7. Presentation by Kim Edward LeBlanc, MD, PhD. President, Louisiana State Board of Medical Examiners to the Louisiana State Medical Society House of Delegates, October 27, 2006, New Orleans, Louisiana. For access to the report, contact Rita Arceneaux at the Louisiana State Board of Medical Examiners, [www.lsbme.la.gov](http://www.lsbme.la.gov) or 504-568-6820.
8. Johnson C. Tulane scales back post-Katrina. CBS News Web site. <http://www.cbsnews.com/stories/2005/12/09/katrina/main1113504.shtml?CMP=>. Accessed March 30, 2007.
9. Infectious Diseases Section, Louisiana State University Health Science Center. Eight months later: Hurricane Katrina aftermath challenges facing the infectious diseases section of the Louisiana State University Health Science Center. *Clin Infect Dis*. 2006;43:485–489.
10. Rudowitz R, Rowland D, Shartz A. Health care in New Orleans before and after Hurricane Katrina. *Health Affairs* 25 (5):w393–w406.
11. FEMA Workshop. Federal Funding Assistance for Community Health and Medical Recovery. Louisiana Department of Health and Hospitals Web site. <http://www.dhh.louisiana.gov/offices/miscdocs>. Accessed February 22, 2007.