

Depressive Symptoms among Firefighters and Related Factors after the Response to Hurricane Katrina

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ABSTRACT *The National Institute for Occupational Safety and Health conducted an evaluation regarding physical and psychological health symptoms among New Orleans firefighters 13 weeks after Hurricane Katrina struck the U.S. Gulf Coast on August 29, 2005. This report examines associations between depressive symptoms and concurrent comorbidity. Depressive symptoms were twice as likely among those with either lower respiratory symptoms or skin rash. Firefighters housed with their families were less likely to report depressive symptoms compared to those not living with their families. Perceived low supervisor support was associated with depressive symptoms, whereas participating in group counseling was not. The results underscore the need for the incorporation of physical and psychological health follow-up of emergency responders after natural disasters to better understand, monitor, and treat their health conditions.*

KEYWORDS *Depressive symptoms, Disaster response, Firefighters, Hurricane, Social support.*

INTRODUCTION

In August and September 2005, hurricanes Katrina and Rita made landfall in the United States, passing within miles of New Orleans, LA. Heavy winds and rain damaged and breached levees protecting the city. These levee breaches resulted in flooding of up to 80% of the city, with water reaching a depth of 20 ft in some areas.¹ When the hurricanes made landfall in New Orleans, more than 600 career firefighters worked for the New Orleans Fire Department (NOFD). Because of the flooding in sections of New Orleans, a number of fire stations were closed and relocated to temporary headquarters until the floodwater receded. During and after the hurricanes, firefighters participated in rescue and recovery activities and continued normal fire suppression duties. Because of the vast devastation and limited personnel, firefighters worked long hours, and many were separated from their families.²

Following the hurricanes, reports of injuries, physical illness, and psychological strain among the NOFD personnel prompted the National Institute for Occupa-

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tional Safety and Health to conduct a health hazard evaluation (HHE) of firefighters.³ This study is part of the HHE conducted 13 weeks after the hurricanes.

Because firefighters are relied upon to provide many of the emergency life saving services during and following a disaster, it is essential that this occupational group remains healthy. Many studies have identified predictors for major depression among first responders after response to natural disasters,⁴⁻⁶ but little is known about the relationship between depressive symptoms and physical symptoms among first responders after a natural disaster. This study examined the association between depressive symptoms and physical health symptoms, as well as psychosocial factors.

METHODS

This cross-sectional survey included firefighters who worked in New Orleans Parish from November 29, 2005, to December 5, 2005, in all fire stations and temporary staging areas. The anonymous, self-administered questionnaire included questions about demographics, past medical history, smoking history, work duties and location, hurricane-related activities, and health symptoms during and after the hurricanes.

The short form of the Center for Epidemiologic Study-Depression scale (CES-D)⁷ was used to define symptoms consistent with major depression. The CES-D scale has shown high levels of reliability and validity to detect both clinical and non-clinical symptoms of depressed mood for a wide range of study populations,^{8,9} including psychiatric populations.¹⁰ The CES-D was not originally designed for administration to those experiencing traumatic natural disasters; however, there is no available instrument specifically designed for a survey in natural disasters. Because of the nature of the hurricanes and resultant floods, and the likelihood that respondents would be experiencing common acute symptoms similar to those found on the depression scale, we chose to narrow our focus to those having major depressive symptoms, and used a cut-off score of 22 out of 60 possible to increase the specificity of the scale. This cut-off score was used previously in another study.¹¹

Persons with new-onset symptoms were defined as those who had any of the following symptoms everyday or almost everyday after Hurricane Katrina and did not have the same symptoms during the week prior to Hurricane Katrina. Lower respiratory symptoms included wheezing, shortness of breath, or chest tightness. Upper respiratory symptoms included head/sinus congestion or nose/throat irritation. Cough with phlegm and cough without phlegm were grouped as "Cough." Skin rash included boil, blister, pimple, itching, redness, or swelling.

Supervisor social support during and after the hurricanes was measured by asking about the participant's satisfaction with supportiveness from supervisors. We also asked participants whether or not they were staying with their families at the time of the survey and whether they received some form of group counseling. Firefighters were considered to have had group counseling if they participated in a group meeting that was held at shift change or when they left the work-site, debriefing held postcrisis (within 1-4 weeks of incident conclusion), or defusing that was held within 72 h of incident conclusion. Those who had a diagnosis of depression and asthma before Katrina were excluded from the analyses.

Statistical Analysis

The posthurricane prevalence of health outcomes, depressive symptoms, and demographics was obtained. The relationships between physical health symptoms and depressive symptoms were assessed by prevalence ratios (PR) and 95% confidence intervals (95% CI). The generalized linear models with Log link and Poisson distribution assumption was employed to estimate PR and 95% CI for covariates adjusting for age, gender, and other terms in the models.^{12,13} The PROC GENMOD in SAS (v.9.12) was used for multiple regression analyses.

RESULTS

Of 683 employees on the latest roster, 525 (77%) completed the questionnaire. There were 774 employees recorded on the prehurricane roster; 59 employees were

TABLE 1 Characteristics of survey participants in NOFD, November 2005

Characteristic	<i>N</i>	% ^a
Age (years)		
20–29	82	15.9
30–39	133	25.8
40–49	172	33.4
50–above	128	24.9
Job years		
<5	128	24.9
5–<15	180	35.0
15–<25	106	20.6
≥25	101	19.6
Smoking status		
Never smoked	308	58.9
Current smoker	107	20.5
Former smoker	108	20.6
Currently staying with family		
No ^b	150	30.6
Yes, sometimes	138	28.2
Yes, always	202	41.2
Supervisor support		
Dissatisfied	162	31.4
Satisfied	354	68.6
Mental health service sought after the hurricane ^c		
Debriefing	158	31.9
Group meeting	107	21.3
Defusing	80	16.1
Individual counseling	64	12.9
Peer support counseling	40	8.4
Counseling follow-up	19	3.8
Family counseling	13	3.6

^aDenominators ranged from 512 to 523 due to missing values

^bIncludes those who did not have family

^cThis question allowed multiple choices

out due to on-the-job injury, 20 employees were on annual leave, and 12 resigned after the hurricanes.

The average age of participants was 42 years (range 20 to 64), and 4% were female. Of the 521 respondents who answered the job category question, 101 (19%) were fire truck/ladder truck operators or engineers, 222 (43%) were line firefighters, and 161 (31%) were officers including 29 chief officers. Thirty-seven employees (7%) were in fire service administration, such as dispatchers, employees of the deputy office, and human resource personnel (Table 1).

TABLE 2 Physical and mental health symptoms reported among New Orleans firefighters (N=525)

Health symptoms and injury	N	Prevalence (%) ^a
New onset respiratory symptoms ^b		
Upper respiratory ^c	162	30.9
Head or sinus congestion	145	27.6
Nose/throat irritation	92	17.3
Cough ^d	124	23.6
Dry cough	89	17.0
Cough with phlegm	84	16.0
Lower respiratory ^e	55	10.5
Shortness of breath with minimal activity	36	6.9
Wheezing/whistling in the chest	29	5.5
Chest tightness	17	3.2
Gastrointestinal symptoms ^f		
Diarrhea	9	1.7
Abdominal pain	9	1.7
Nausea or vomiting	7	1.3
Skin problems		
Any skin problems	328	62.5
Skin rash ^g	258	49.1
Cut	196	37.3
Itch	178	33.9
Pimple	135	25.7
Redness	112	21.3
Pain	108	20.6
Blister	57	10.9
Swell	53	10.1
Boil	31	5.9
Psychological symptoms		
Depressive symptoms ^h	133	27.0

^aDenominator was 525 except for depressive symptoms (N=492)

^bNew-onset individual symptoms were defined by a positive response to the question "Have you had any of the following symptoms after the hurricane Katrina?" and having these symptoms "Almost everyday or everyday" and "Had no symptoms prior to hurricane Katrina"

^cUpper respiratory symptom defined as having either (1) head/sinus congestion or (2) nose/throat irritation

^dCough defined as having either (1) dry cough or (2) cough with phlegm

^eLower respiratory symptoms defined as having (1) shortness of breath, (2) wheezing, or (3) chest tightness

^fNew-onset gastrointestinal symptoms were defined by a positive response to the question "Have you had any of the following symptoms after the hurricane Katrina?" and having these symptoms "Almost everyday or everyday" and "Had no symptoms prior to Hurricane Katrina"

^gSkin rash defined as experiencing (1) bumps, (2) blisters, (3) boils, (4) itching, (5) swelling, or (6) redness

^hDepressive symptom was defined using the CES-D and above the score 22 out of 60

One hundred and fifty employees (31%) were not staying with their family at the time of this survey. Some form of group counseling service from the NOFD was used by 210 (40%); 158/495 (32%) participated in debriefings; 107/502 (21%) participated in group meetings; and 80/497 (16%) participated in defusing meetings. One hundred and sixty two (31%) respondents reported dissatisfaction concerning supportiveness from their supervisors (Table 1).

Table 2 lists the prevalence of health symptoms since the hurricanes. Of the 525 firefighters, 162 (31%) reported new-onset upper respiratory symptoms, lower respiratory symptoms (55 [11%]), and cough (124 [24%]). Skin rash was reported by 258 (49%) of respondents. One hundred and thirty-three of 493 respondents

TABLE 3 Prevalence of depressive symptoms by covariates and PR of depressive symptoms for covariates

Covariates	No (%) ^a	Prevalence (%)	Crude		Adjusted ^b	
			PR	95% CI	PR	95% CI
Age						
20–29	78 (16.1)	24.4	0.97	(0.55, 1.74)	1.20	(0.63, 2.27)
30–39	130 (26.9)	32.3	1.29	(0.81, 2.07)	1.43	(0.87, 2.36)
40–49	160 (33.1)	25.6	1.02	(0.64, 1.65)	1.13	(0.68, 1.88)
≥50	116 (24.0)	25.0	1		1	
Sex						
Female	20 (4.1)	50.0	1.91	(1.00, 3.64)	1.36	(0.62, 2.95)
Male	470 (95.9)	26.2	1		1	
Upper respiratory symptoms ^c						
Yes	159 (32.3)	39.0	1.83	(1.30, 2.57)	1.30	(0.86, 1.94)
No	333 (67.7)	21.3	1		1	
Lower respiratory symptoms ^d						
Yes	54 (11.0)	64.8	2.90	(1.97, 4.26)	1.84	(1.15, 2.96)
No	438 (89.0)	22.4	1		1	
Gastrointestinal symptoms ^e						
Yes	18 (3.7)	72.2	2.85	(1.61, 5.06)	1.43	(0.74, 2.74)
No	474 (96.3)	25.3	1		1	
Skin rash ^f						
Yes	250 (50.8)	35.6	1.96	(1.36, 2.81)	1.74	(1.17, 2.58)
No	242 (49.2)	18.2	1		1	
Supervisor support						
Dissatisfied	152 (30.9)	40.1	1.90	(1.35, 2.67)	1.59	(1.10, 2.30)
Satisfied	340 (69.1)	21.2	1		1	
Group counseling						
Not received	202 (41.1)	23.8	1.23	(0.87, 1.76)	1.22	(0.84, 1.79)
Received	290 (58.9)	29.3	1		1	
Living with family						
Yes	320 (69.7)	22.5	0.63	(0.44, 0.90)	0.67	(0.46, 1.00)
No	139 (30.3)	36.0	1		1	

^aDenominators ranged from 512 to 525 due to missing values

^bPR adjusted for all covariates in the model (N=450)

^cUpper respiratory symptom defined as having either (1) head/sinus congestion or (2) nose/throat irritation

^dLower respiratory symptoms defined as having (1) shortness of breath, (2) wheezing, or (3) chest tightness

^eGastrointestinal symptoms were defined as having (1) diarrhea, (2) abdominal pain, or (3) nausea or vomiting

^fSkin rash defined as experiencing (1) bumps, (2) blisters, (3) boils, (4) itching, (5) swelling, or (6) redness

(27%) had major depressive symptoms. Ten (2%) of 113 respondents with depressive symptoms reported previous major depressions diagnosed by health care providers (results not shown). They were later excluded from the multiple regression analysis. Twenty (3.8%) of 525 firefighters reported a previous diagnosis of asthma by health care providers, and were excluded from the multiple regression analysis. Prevalence of depressive symptoms among the 20 respondents was not significantly different from that of subjects included in the analysis.

Factors Associated with Depression

The prevalence and PR of depressive symptoms by physical health symptoms and psychosocial factors are shown in Table 3. In multivariate analysis adjusting for all covariates in the model, we found that persons with new-onset lower respiratory symptoms had significantly higher risk of depressive symptoms (PR=1.8; 95% CI: 1.2, 3.0) compared to those without new-onset respiratory symptoms. Depressive symptoms were also associated with skin rash (PR=1.7; 95% CI: 1.2, 2.6) and dissatisfaction with supervisory support (PR=1.6; 95% CI: 1.1, 2.3). Firefighters who answered that they were currently living with their families were less likely to report depressive symptoms (PR=0.7; 95% CI: 0.5, 1.0) than those not living with their families. Participation in a group counseling service was not associated with depressive symptoms.

DISCUSSION

Following the hurricanes, the NOFD received anecdotal reports from firefighters about health symptoms suggestive of depression and anxiety including physical health symptoms. Firefighters were dealing with work-related stressors, such as extended working hours, sleep deprivation, violent threats, and lack of communication with coworkers. Many also experienced personal stressors, such as displacement of family members, destruction of their homes, and lack of communication with families.²

The prevalence of respiratory symptoms and skin rashes reported by NOFD firefighters are similar to those found among relief workers reported through the Centers for Disease Control and Prevention active surveillance system in the Greater New Orleans area after the hurricanes.¹⁴⁻¹⁶

Depressive symptoms were twice as likely among those with either lower respiratory symptoms or skin rash. Coexistence of depression and physical symptoms has been reported in several studies.¹⁷⁻²² It is possible that those with depressive symptoms may report more physical symptoms than those without depressive symptoms. Due to the nature of this cross-sectional survey, however, the results from this investigation could not assess whether depressive symptoms among firefighters are attributed to persistent physical symptoms. Joy et al. suggested that workers with physical injury are at higher risk of developing acute psychological disorders;²³ it is not known whether physical health symptoms alone would have a similar effect on mental health. Nonetheless, considering comorbidity of depressive symptoms and physical health symptoms, appropriate clinical evaluation should address both psychological health issues and physical health symptoms.

Studies have shown that depression and posttraumatic stress disorders (PTSD) are among the most common problems for populations exposed to natural disasters.^{4,24} Our previous report also showed that 22% of these firefighters in

New Orleans reported symptoms consistent with PTSD after the response to Hurricane Katrina.³ In a study involving the general population following an earthquake,²⁵ the authors suggested that the main risk factor for depression is the amount of loss that the person has sustained. Risk of depression was also higher among persons whose family members were injured. Regehr et al. suggested that low social support is an important determinant of depressive symptoms and PTSD among firefighters.^{26,27} Consistent with previous findings,^{28,29} psychosocial factors such as supervisor and family support were also important factors related to depressive symptoms among NOFD personnel. Those who reported that they were living with their families had a lower risk of depressive symptoms. Adequate relief shifts after a response to disaster will allow firefighters more opportunity for family support. The effectiveness of such organizational support has not been evaluated yet. Thus, future research to characterize and develop measures of organizational support in a disaster setting are needed to reduce the burden of health outcomes after responding to natural disasters.

A relatively high response rate was obtained (77%) for available firefighters, minimizing the potential for selection bias. However, the participants included current firefighters only and excluded those who were on sick leave and on-the-job injury leave. Thus, there may be a potential selection bias that may lead to underestimation of the relationships between health symptoms and exposure related to the hurricanes. The findings in this investigation are also subject to recall bias. Respondents who experienced depressive symptoms may have overreported the dissatisfaction with their supervisor's support, which may have led to overestimation of the relationship.

Responses to extraordinary natural disasters, such as the hurricanes, may provoke a number of physical and psychological reactions. Many of the symptoms firefighters experienced may be normal and reversible reactions to a traumatic event. However, to better prepare for future disasters, it is important to understand the patterns of occupational health symptoms that may result from responding to natural disasters. Efforts aimed at reducing psychological and physical strain among emergency responders during and after responding to disasters will benefit preparedness against the inevitable consequences of natural or technological disasters. The findings of this study could be helpful in understanding associated factors and identifying appropriate steps to reduce long-term impact from these events.

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