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Posttraumatic Stress Disorder, Depression, and Alcohol and Tobacco Use in Public Health Workers After the 2004 Florida Hurricanes

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Abstract

Objective—We examined the relationship of probable posttraumatic stress disorder (PTSD), probable depression, and increased alcohol and/or tobacco use to disaster exposure and work demand in Florida Department of Health workers after the 2004 hurricanes.

Methods—Participants (N = 2249) completed electronic questionnaires assessing PTSD, depression, alcohol and tobacco use, hurricane exposure, and work demand.

Results—Total mental and behavioral health burden (probable PTSD, probable depression, increased alcohol and/or tobacco use) was 11%. More than 4% had probable PTSD, and 3.8% had probable depression. Among those with probable PTSD, 29.2% had increased alcohol use, and 50% had increased tobacco use. Among those with probable depression, 34% indicated increased alcohol use and 55.6% increased tobacco use. Workers with greater exposure were more likely to have probable PTSD and probable depression (ORs = 3.3 and 3.06, respectively). After adjusting for demographics and work demand, those with high exposure were more likely to have probable PTSD and probable depression (ORs = 3.21 and 3.13). Those with high exposure had increased alcohol and tobacco use (ORs = 3.01 and 3.40), and those with high work demand indicated increased alcohol and tobacco use (ORs = 1.98 and 2.10). High exposure and work demand predicted increased alcohol and tobacco use, after adjusting for demographics, work demand, and exposure.

Conclusions—Work-related disaster mental and behavioral health burden indicate the need for additional mental health interventions in the public health disaster workforce.

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Keywords

PTSD; depression; alcohol use; public health workers; hurricane

The 2004 Florida hurricane season was unprecedented. Within a period of 7 weeks, 4 hurricanes and 1 tropical storm made landfall.[1,2] The $4.85 billion in costs incurred for hurricane relief accounted for nearly 88% of the total disaster aid in 2004.[3] State and local public health workers played a critical role as first responders in this and other disasters.

Concern for public health response to natural disasters has increased during the past decade in the aftermath of 9/11, the tsunamis in Asia and Japan, Hurricane Katrina, and the Haiti earthquakes. Public health and disaster workers experience acute and longer term posttraumatic stress disorder (PTSD) and health risk behaviors such as increased alcohol and increased tobacco use.[4] However, few studies have addressed large populations regarding these important components of our emergency public health response.

Work-related exposure to disasters has been associated with PTSD and depression in disaster workers.[5] A meta-analysis of 38 studies of rescue workers (N = 20 000) found that the worldwide pooled prevalence of PTSD was 10%.[6] The prevalence of PTSD in rescue workers enrolled in the World Trade Center health registry was 12.4% (range, 6.2% for police to 21.2% for volunteers).[7] Firefighters and mortuary workers have high levels of PTSD symptoms.[8–10] In an epidemiological study of first responders, symptoms of PTSD and depression increased with the number of critical work-related exposures.[11] Firefighters working at the Oklahoma City bombing were more likely to have PTSD if they had longer exposure to the bomb site.[10] Symptoms of major depression were reported by 27% of firefighters 13 weeks after responding to Hurricane Katrina.[12]

Few studies have examined the risk factors for increased alcohol and tobacco use in disaster workers. Almost half of the disaster workers reported drinking more alcohol than usual during the time that they worked at the World Trade Center, and about one-third continued increased use.[13] Smoking in ambulance personnel following the fireworks disaster in Enschede, the Netherlands, predicted symptoms of PTSD and depression 18 months after the disaster.[14] Increased tobacco use has been reported in 29% of disaster workers following 9/11, and 23% of former smokers resumed cigarette smoking.[15]

The 2004 hurricane season provided a unique opportunity to examine public health workers of the Florida Department of Health (FDOH) who experienced repeated deployments, high work demand, and both work and family stressors in responding to the hurricanes. Specifically, we examined the relationship of probable PTSD, probable depression, and increased alcohol and tobacco use 9 months posthurricanes to disaster exposure and work demand in public health workers.

METHODS

Participants and Procedures

Approximately 9 months after the 2004 hurricane season, questionnaires were distributed to FDOH employees using e-mail distribution lists. Participation was voluntary and anonymous, and completed questionnaires were transmitted electronically. Two versions of the questionnaire (ie, A and B) were distributed randomly so that each potential participant received only one version or the other. Questionnaire versions contained some of the same items and some unique items; version A focused on mental health items and version B emphasized workplace issues. Of an estimated 8564 FDOH personnel who worked during the 2004 hurricanes and were available at the time of the survey, we were able to contact and invite 6637 individuals to participate. After reading a description of the study and the informed consent, 4323 agreed to participate, and they completed and returned the questionnaire (version A = 2249; version B = 2074); the estimated response rate was 65.1%. This study used version A respondents. The participants ranged in age from 20 to 78 years (median = 49 years). The majority were women (80.4%; N = 1787) and currently married (66.5%, N = 1482). The majority were White (73.9%, N = 1623); 13.3% (N = 291) were African American; 8.7% (N = 190) were Hispanic; and 4.2% (N = 92) marked Other. Nearly half of the participants had less than a bachelor's degree (48.9%, N = 1091).

Measures

Probable PTSD—Probable PTSD was assessed with the 17-item PTSD checklist (PCL-17).[16] The PCL-17 lists all symptoms of PTSD according to the *Diagnostic and Statistical Manual (Fourth Edition*) (*DSM-IV*). Respondents rated how much they were bothered by those symptoms in the past month as it relates to their experience with the hurricanes. Possible responses were 1, not at all; 2, a little bit; 3, moderately; 4, quite a bit; and 5, extremely. Responses were summed with a range from 17 to 85. Studies in primary care settings have validated the use of PCL-17 scores of 30 or greater as indicative of probable PTSD (sensitivity = .86, specificity = .76).[17,18] This study combined the aforementioned criterion with a more clinically based indicator by using *DSM-IV* criteria: 1 intrusion symptom, 3 avoidance symptoms, and 2 hyperarousal symptoms, each present at the level of moderate or higher during the previous month. Respondents meeting both the total score and *DSM-IV* criteria were classified as having probable PTSD.

Probable Depression—Probable depression was assessed with the Patient Health Questionnaire Depression Scale (PHQ-9).[19] Probable depression was present when at least 5 of the 9 symptoms were present ''more than half the days'' or ''nearly every day'' in the past 2 weeks, and 1 of the symptoms was depressed mood or anhedonia. One of the symptoms (''thoughts that you would be better off dead or of hurting yourself in some way'') was considered present if the respondent indicated presence regardless of duration. When compared to structured clinical evaluations in primary care settings, the PHQ-9 demonstrated 73% sensitivity and 94% specificity.[20,21]

Alcohol Use—An increase in alcohol use by alcohol users was assessed with 1 question[22]: ''Since the hurricanes did you change your drinking habits for any 2-week period of time or

more?'' Possible responses were 1, I do not drink alcohol; 2, the amount I drank remained the same; 3, I drank more than usual; 4, I drank less than usual; and 5, I had stopped drinking but started again. Increased alcohol use was indicated if response choices 3 or 5 were selected and was compared to decreased or no change in alcohol use (response choices 2 and 4) in subsequent analyses. Persons indicating no use of alcohol were removed when evaluating change in alcohol use.

Tobacco Use—An increase in tobacco use by tobacco users was assessed with 1 question[22,23]: ''Since the hurricanes did you change any tobacco habits (cigarettes, pipe, cigars, chewing tobacco) for any 2-week period of time or more?'' Possible responses were 1, I do not use tobacco; 2, my tobacco use remained the same; 3, I increased my use of tobacco; 4, I decreased my use of tobacco; and 5, I had stopped using tobacco but started using it again. Scoring of this item was completed in the same way as the use of alcohol.

Hurricane Exposure—Exposure at the time of the hurricanes was assessed by being in the actual path of any of the 5 storms and amount of injury and damage. Injury and damage were assessed by experience of any of the following 6 events during each of the 5 hurricanes: relocation due to damage to one's home, damage to vehicle, injury or harm to self, injury or harm to spouse/ significant other, injury/harm to children, and injury/harm to pets. A high level of hurricane exposure was indicated if respondents were in the path and experienced injury or damage for at least 1 storm.

Hurricane Work Demand—Work demand at the time of the hurricanes was assessed using 3 items: the number of hurricanes during which hurricane-related work was performed, the number of days during the hurricane response that at least 12 of 24 hours were worked, and the number of weeks that the hurricane response lasted before returning to a prehurricane work schedule. The work demand scale was dichotomized; high indicated that at least 2 of the following 3 criteria were met: 1, working at least 2 hurricanes; 2, working more than 12 hours on at least 7 days; and 3, a hurricane response lasting at least 4 weeks.

Statistical Analysis

Potential risk factors for probable PTSD, probable depression, increased alcohol use, and increased tobacco use at 9 months posthurricane in FDOH employees were evaluated using univariate logistic regressions and χ^2 analyses. Odds ratios were defined as the likelihood of experiencing probable PTSD, probable depression, increased alcohol use, and increased tobacco use for individuals with versus without a risk factor. Hurricane exposure, work demand, and each potential demographic risk factor for probable PTSD, probable depression, and increased alcohol and tobacco use were also evaluated while controlling for the remaining risk factors using logistic regressions. The estimate of the odds ratio and its 95% confidence interval (CI) were reported. The likelihood ratio (LR) χ^2 test was used to determine any difference between the odds for individuals with versus without a risk factor. Hosmer-Lemeshow goodness-of-fit $\chi 2$ analyses assessed how well the model predicted the data.[24] Statistical analyses were conducted using SPSS, Release 16.0.2[25] and Stata, Release 9.2.[26]

RESULTS

The total mental and behavioral health burden (ie, those with 1 or more of the following: probable PTSD, probable depression, increased alcohol use, and/or increased tobacco use) was 11% (N = 229). More than 4% (4.5%, N = 97) of FDOH employees had probable PTSD, and 3.8% (N = 81) had probable depression. Of those with probable PTSD, 43.6% (N = 41) had probable depression compared to 1.8% (N = 37) without PTSD ($\chi 2 = 39.72$, $df = 1$, $P < .001$). Of those with probable depression, 52.6% (N = 41) had probable PTSD compared to 2.6% (N = 53) without depression ($\chi 2 = 39.72$, $df = 1$, $P < .001$).

Of those who drink alcohol, 7.0% (N = 70) reported increased alcohol use for at least a 2-week period since the hurricanes. Among those with probable PTSD who drink alcohol, 29.2% (N = 14) reported increased alcohol use compared to those without PTSD (5.9%, N = 55; $\chi 2 = 38.10$, $df = 1$, $P < .001$). Among those with probable depression who drink alcohol, 34% (N = 12) reported increased alcohol use compared to those without probable depression (5.9%, N = 56; $\chi 2 = 41.92$, $df = 1$, $P < .001$).

Of those who use tobacco, 22.1% (N = 73) reported increased tobacco use for at least a 2-week period since the hurricanes. Among those with probable PTSD who use tobacco, 50% (N = 9) reported increased tobacco use compared to those without PTSD (20.6%, N = 64; $\chi 2 = 8.53$, $df = 1$, $P = .003$). Among those with probable depression who use tobacco, 55.6% (N = 10) reported increased tobacco use compared to those without depression (20.6%, N = 63; $\chi 2 = 11.91$, $df = 1$, $P = .001$).

Sixteen percent (N = 359) of the respondents reported high levels of hurricane exposure, including being in the path of at least 1 storm and experiencing damage to self, significant others, or property. Nearly 30% (29.8%, N = 663) reported high levels of work demand during the hurricane including at least 2 of the following: working at least 2 hurricanes, working more than 12 hours on at least 7 days, and a hurricane response lasting at least 4 weeks.

Probable Posttraumatic Stress Disorder

Those not married were 1.78 times more likely to meet criteria for probable PTSD in the past month (6.3%, N = 45) than those who were married (3.6%, N = 51) (see Table 1). Those whose home was in the path of at least 1 storm and who experienced damage to self, significant others, or property were 3.30 times more likely to meet criteria for probable PTSD in the past month (10.4%, N = 36 vs 3.4%, N = 61) (see Table 1). Work demand was not associated with probable PTSD.

To further investigate the relationship of hurricane exposure and work demand to probable PTSD, we examined a regression model that included all demographic variables, both hurricane exposure and work demand, and the interaction between hurricane exposure and work demand. In this and all subsequent analyses, the interaction was not significant ($P < .10$) and was therefore dropped from the final model. Those whose homes were in the path of at least 1 storm and who experienced damage to self, significant others, or property continued to be at increased risk of probable PTSD (OR = 3.21; LR $\chi 2 = 22.41$, $df = 1$, $P <$.

001, 95% CI = 2.04–5.08) (see Table 1). Those who were not married were at a greater risk for probable PTSD (OR = 1.94; LR $\chi 2 = 8.98$, $df = 1$, $P = .003$, 95% CI = 1.26–2.99).

Probable Depression

Those with a lower level of education (less than a bachelor's degree) were 1.82 times more likely to have probable depression in the past 2 weeks (4.9%, N = 51) than those with a higher level of education (2.8%, N = 30) (see Table 2). Those with high levels of hurricane exposure were 3.06 times more likely to have probable depression (8.4%, N = 29 vs 2.9%, N = 52) (see Table 2). Work demand was not associated with depression. A regression model including all demographic variables and both hurricane exposure and work demand further examined the relationship of hurricane exposure and work demand to probable depression. Those with high levels of hurricane exposure remained at greater risk for probable depression (OR = 3.13; LR $\chi 2 = 18.52$, $df = 1$, $P < .001$, 95% CI = 1.92–5.10) (see Table 2). Those with less education also continued to be at greater risk of probable depression (OR = 1.78; LR $\chi 2 = 5.46$, $df = 1$, $P = .020$, 95% CI = 1.09–2.91).

Increased Alcohol Use

Those with high levels of hurricane exposure were 3.01 times more likely to report increased alcohol use for at least a 2-week period (14.9%, N = 24 vs 5.5%, N = 46) (see Table 3). Similarly, those with high work demand during the hurricanes were 1.98 times more likely to report increased alcohol use (10.0%, N = 37 vs 5.3%, N = 33). The regression model, which included exposure, work demand, and the demographic variables, revealed that those with high hurricane exposure continued to be at increased risk of increased alcohol use for at least a 2-week period (OR = 3.09; LR $\chi 2 = 14.47$, $df = 1$, $P < .001$, 95% CI = 1.78–5.38) (see Table 3). Similarly, those with greater work demand at the time of the hurricanes remained at an elevated risk (OR = 1.70; LR $\chi 2 = 4.01$, $df = 1$, $P = .045$, 95% CI = 1.01–2.85). There were no significant demographic risk factors. Those with increased alcohol use did not differ from those with either no change or decreased alcohol use over a 2-week period on gender, race, age, education, or marital status (see Table 3).

Increased Tobacco Use

Those with high levels of hurricane exposure were 3.40 times more likely to report increased tobacco use over at least a 2-week period (41.9%, N = 26 vs 17.5%, N = 47) (see Table 4). Similarly, those with high work demand during the time of the hurricanes were 2.10 times more likely to report increased tobacco use (31.7%, N = 32 vs 18.1%, N = 41). Those with increased tobacco use over at least a 2-week period did not differ from those with no change or a decrease in tobacco use on any demographic characteristic (see Table 4).

The regression model, which included hurricane exposure, work demand, and the demographic variables, revealed that those with high levels of hurricane exposure remained at a heightened risk (OR = 3.23; LR $\chi 2 = 12.66$, $df = 1$, $P = .004$, 95% CI = 1.71–6.12) (see Table 4). Similarly, those with greater work demand continued to be at increased risk (OR = 2.11; LR $\chi 2 = 5.77$, $df = 1$, $P = .163$, 95% CI = 1.15–3.85). There were no significant demographic risk factors.

DISCUSSION

The 2004 hurricane season provided an opportunity to examine public health workers at the FDOH who responded to multiple hurricanes and experienced both high work demand and personal exposure. The total mental and behavioral health burden was 11% (ie, people with probable PTSD, probable depression, increased alcohol use, and/or increased tobacco use); however, it is unclear whether the increased alcohol and/or tobacco use was a transient change for 2 weeks during or in the 9 months following the hurricanes or a more permanent change. Nine months after the hurricanes, 4.5% had probable PTSD and 3.8% had probable depression as compared to the 1-year population prevalence of 3.5% for PTSD and 6.7% for depression taken from a nationally representative sample of US adults.[27] Personal hurricane damage and injury was related to a higher probability of PTSD, depression, and alcohol and tobacco use. Those with probable PTSD and probable depression were also more likely to report increased alcohol use and increased tobacco use. Interestingly, higher work demands were associated with increased more alcohol and tobacco use but not with probable PTSD or probable depression.

Postdisaster mental health comorbidity is related to decrements in disaster response capacity in the public health workforce. These findings at 9 months after the hurricanes indicate the likelihood of substantial mental health problems in the months immediately after the hurricanes. The higher the number of disorders, the greater the effects on functioning and poor outcome.[28,29] Comorbidity following trauma supports the interrelationship of various disorders (as well as underlying related endophenotypes) to environmental stressors.

Importantly, greater exposure to hurricane stressors is not only associated with probable PTSD but also with probable depression. Those with greater hurricane exposure were 3.06 times more likely to report probable depression. Depression as a trauma-related outcome has not been examined as extensively as posttraumatic stress disorders. Future research should specifically examine depression following trauma as new onset depression. After adjusting for demographics and work demand, those with greater exposure remained at risk for probable depression (OR = 3.13).

In contrast to probable PTSD and probable depression, both high hurricane exposure and work demand during the hurricanes were associated with increased alcohol use and tobacco use. These remained strong predictors even after adjusting for demographics; adjusting for work demand in the case of exposure; and adjusting for exposure in the case of work demand. Increases in alcohol use are associated with negative health outcomes including family violence, increased motor vehicle accidents, and increased tobacco use.[4,9,22] Our findings highlight the need to better understand disaster-related workplace demands. These stressors are distinct from other personal injury or damage that can affect health risk behaviors of alcohol and tobacco use, although perhaps are not related to PTSD and depression. Interventions directed specifically to workplace demands may alter alcohol and/or tobacco use but not PTSD and depression.

Limitations

Several limitations of this study should be taken into account. This is a cross-sectional study, therefore further research using a longitudinal design is recommended to better determine the course of probable PTSD and probable depression over time and its relationship to health risk behaviors. Collecting data on early posttraumatic response and systematic sampling using multimethod approaches allows for larger and more representative samples; however, it is challenging working with highly mobile sample populations such as participants who may have left the FDOH shortly after the hurricane season. Collecting information on previous psychiatric history and history of alcohol and/or tobacco use in future studies is important to better understanding response to trauma. In addition, future research should examine the relationship of symptom severity and limitations on the ability to perform work. Because these data were collected electronically, it would be useful to examine the possibility of nonresponse bias.

CONCLUSIONS

The health of public health workers is critical to sustaining the nation's health. Work-related disaster mental and behavioral health burdens, such as, high rates of probable PTSD, probable depression, and health risk behaviors suggest the need for mental health interventions in the workplace. These findings have implications for disaster planning in the workplace, such as, shift rotation to minimize exposure and the role of disaster work demands on risk for increased alcohol and/or tobacco use. The costs of postdisaster PTSD, depression, and health risk behaviors are significant and should be included in disaster planning for primary care and public health workers.

References

1. Acierno R, Ruggiero K, Galea S, et al. Psychological sequelae resulting from the 2004 Florida hurricanes: implications for postdisaster intervention. Am J Public Health. 2007; 97(suppl 1):S103–S108. [PubMed: 17413067]
2. 2004 Atlantic Hurricane Season. Miami, FL: National Hurricane Center; http://www.nhc.noaa.gov/2004atlan.shtml [Accessed February 16, 2009]
3. 2004 Hurricanes lead record disaster year for FEMA. Washington, DC: Federal Emergency Management Agency; Jan 5. 2005 http://www.fema.gov/news/newsrelease.fema?id=15967 [Accessed January 9, 2005]
4. Benedek DM, Fullerton CS, Ursano RJ. First responders: mental health consequences of natural and human-made disasters for public health and public safety workers. Annual Rev Public Health. 2007; 28:55–68. [PubMed: 17367284]
5. Bills CB, Levy NAS, Sharma V, et al. Mental health of workers and volunteers responding to events of 9/11: review of the literature. Mount Sinai J Med. 2008; 75:115–127.
6. Berger W, Coutinho ES, Figueira I, et al. Rescuers at risk: a systematic review and meta-regression analysis of the worldwide current prevalence and correlates of PTSD in rescue workers. Soc Psychiatry Psychiatr Epidemiol. 2012; 47(6):1001–1111. [PubMed: 21681455]
7. Perrin MA, DiGrande L, Wheeler K, et al. Differences in PTSD prevalence and associated risk factors among world trade center disaster rescue and recovery workers. Am J Psychiatry. 2007; 164:1385–1394. [PubMed: 17728424]
8. Fullerton CS, McCarroll JE, Ursano RJ, et al. Psychological responses of rescue workers: fire fighters and trauma. Am J Orthopsychiatry. 1992; 62:371–378. [PubMed: 1497102]

9. McCarroll JE, Fullerton CS, Ursano RJ, et al. Posttraumatic stress symptoms following forensic dental identification: Mt. Carmel, Waco, Texas. Am J Psychiatry. 1996; 153(6):778–782. [PubMed: 8633689]
10. North CS, Tivis L, McMillen JC, et al. Psychiatric disorders in rescue workers after the Oklahoma City bombing. Am J Psychiatry. 2002; 159:857–859. [PubMed: 11986143]
11. Ward CL, Lombard CJ, Gwebushe N. Critical incident exposure in South African emergency services personnel: prevalence and associated mental health issues. Emerg Med J. 2006; 23(3): 226–231. [PubMed: 16498167]
12. Tak S, Discoll R, Bernard B. Depressive symptoms among firefighters and related factors after the response to Hurricane Katrina. J Urban Health. 2007; 84(2):153–161. [PubMed: 17216569]
13. Stellman JM, Smith RP, Katz CL, et al. Enduring mental health morbidity and social function impairment in world trade center rescue, recovery, and cleanup workers: the psychological dimension of an environmental health disaster. Environ Health Perspect. 2008; 116(9):1248–1253. [PubMed: 18795171]
14. Van der Velden PG, Kleber RJ, Koenen KC. Smoking predicts posttraumatic stress symptoms among rescue workers: a prospective disaster study of ambulance personnel. Drug Alcohol Depend. 2008; 94:267–271. [PubMed: 18093750]
15. Bars MP, Banauch GI, Appel D, et al. Tobacco free with FDNY: the New York City fire department world trade center tobacco cessation study. Chest. 2006; 129:979–987. [PubMed: 16608947]
16. Weathers, F.; Ford, J. Psychometric review of PTSD checklist (PCL-C, PCL-S, PCL-M, PCL-PR). In: Stamm, BH., editor. Measurement of Stress, Trauma, and Adaptation. Lutherville, MD: Sidran Press; 1996. p. 250-251.
17. Lang AJ, Laffaye C, Satz, et al. Sensitivity and specificity of the PTSD checklist in detecting PTSD in female veterans in primary care. J Trauma Stress. 2003; 16(3):257–264. [PubMed: 12816338]
18. Walker EA, Newman E, Dobie DJ, et al. Validation of the PTSD checklist in an HMO sample of women. Gen Hosp Psychiatry. 2002; 24:375–380. [PubMed: 12490338]
19. Spitzer RL, Kroenke K, Williams JBW. Validation and utility of a self-report version of PRIME-MD: the PHQ Primary Care Study. JAMA. 1999; 282(18):1737–1744. [PubMed: 10568646]
20. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med. 2001; 16(9):606–613. [PubMed: 11556941]
21. Spitzer RL, Williams JBW, Kroenke K, et al. Validity and utility of the PRIME-MD Patient Health Questionnaire in the assessment of 3000 obstetric-gynecological patients: the PRIME-MD Patient Health Questionnaire Obstetrics-Gynecology Study. Am J Obstetrics Gynecol. 2000; 183(3):759–769.
22. Grieger TA, Fullerton CS, Ursano RJ. Posttraumatic stress disorder, alcohol use, and perceived safety after the terrorist attack on the pentagon. Psychiatr Serv. 2003; 54:1380–1382. [PubMed: 14557524]
23. Biggs QM, Fullerton CS, Reeves JJ, et al. Acute stress disorder, depression and tobacco use in disaster workers following 9/11. Am J Orthopsychiatry. 2010; 80(4):586–592. [PubMed: 20950299]
24. Hosmer DW, Lemeshow S. Goodness of fit tests for the multiple logistic regression model. Commun Stat Theory Methods. 1980; A9(10):1043–1069.
25. SPSS for Windows: Release 16.0.2. Chicago, IL: SPSS Inc; 2008.
26. Stata Statistical Software: Release 9. College Station, TX: StataCorp LP; 2005.
27. Kessler RC, Chiu WT, Demler O, Merikangas KR, Walters EE. Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. Arch Gen Psychiatry. 2005; 62:617–627. [PubMed: 15939839]
28. Kessler RC, Barker PR, Colpe LJ, et al. Screening for serious mental illness in the general population. Arch Gen Psychiatry. 2003; 60:184–189. [PubMed: 12578436]
29. Kessler RC, Ormel J, Petukhova M, et al. Development of lifetime comorbidity in the world health organization world mental health surveys. Arch Gen Psychiatry. 2011; 68(1):90–100. [PubMed: 21199968]

TABLE 1

Relationship of Possible Risk Factors to Probable PTSD in FDOH Employees[a]

	Prevalence of Probable PTSD, %		Crude[a]		Adjusted[b]	
			Likelihood of PTSD	Analysis	Likelihood of PTSD	Analysis
Risk Factor	**Employees With Risk Factor**	**Employees Without Risk Factor**	**Odds Ratio (95% CI)**	**LR χ^2 (*df* = 1) (*P*)**	**Odds Ratio (95% CI)**	**LR χ^2 (*df* = 1) (*P*)**
PTSD						
Female	4.5	4.7	0.95 (0.57–1.59)	0.03 (0.855)	1.27 (0.72–2.25)	0.65 (0.420)
White	4.7	3.8	1.27 (0.77–2.11)	0.91 (0.339)	1.41 (0.83–2.40)	1.73 (0.189)
Younger (< 49 y)	4.9	4.4	1.13 (0.75–1.65)	0.32 (0.570)	1.16 (0.75–1.79)	0.44 (0.508)
Education < BA/BS	5.3	3.9	1.40 (0.93–2.04)	2.60 (0.107)	1.43 (0.91–2.24)	2.47 (0.116)
Nonmarried	6.3	3.6	1.78 (1.18–2.69)	7.44 (0.006)	1.94 (1.26–2.99)	8.98 (0.003)
Exposure	10.4	3.4	3.30 (2.15–5.07)	26.25 (< 0.001)	3.21 (2.04–5.08)	22.41 (< 0.001)
Work demand	5.4	4.2	1.32 (0.86–2.02)	1.58 (0.209)	1.04 (0.66–1.65)	0.03 (0.868)

Abbreviations: FDOH, Florida Department of Health; LR χ^2 , likelihood ratio χ^2 ; PTSD, posttraumatic stress disorder.

[a]Ns for the univariate analyses vary across analyses due to differing levels of missing data across the different variables.

[b]Adjusted for gender, race, education, marital status, hurricane exposure, and work demand;

LR χ^2 = 36.61, *df* = 7, *P* < .001; Hosmer-Lemeshow goodness-of-fit χ^2 = 4.71, *df* = 7, *P* = .695

TABLE 2

Relationship of Possible Risk Factors to Probable Depression in FDOH Employees[a]

	Prevalence of Probable Depression, %		Crude[a]		Adjusted[b]	
			Likelihood of Depression	Analysis	Likelihood of Depression	Analysis
Risk Factor	**Employees With Risk Factor**	**Employees Without Risk Factor**	**Odds Ratio (95% CI)**	**LR χ^2 (*df* = 1) (*P*)**	**Odds Ratio (95% CI)**	**LR χ^2 (*df* = 1) (*P*)**
Depression						
Female	3.9	3.7	1.04 (0.59–1.84)	0.02 (0.899)	1.38 (0.75–2.55)	1.04 (0.308)
White	4.0	3.4	1.17 (0.69–2.00)	0.35 (0.557)	1.30 (0.74–2.27)	0.86 (0.353)
Younger (< 49 y)	4.2	3.6	1.18 (0.75–1.85)	0.53 (0.469)	1.12 (0.71–1.79)	0.24 (0.624)
Education < BA/BS	4.9	2.8	1.82 (1.15–2.88)	6.76 (0.009)	1.78 (1.09–2.91)	5.46 (0.020)
Nonmarried	4.5	3.4	1.33 (0.85–2.11)	1.50 (0.221)	1.41 (0.88–2.25)	1.99 (0.159)
Exposure	8.4	2.9	3.06 (1.91–4.90)	19.25 (< 0.001)	3.13 (1.92–5.10)	18.52 (< 0.001)
Work demand	3.9	3.8	1.03 (0.64–1.67)	0.02 (0.890)	1.09 (0.66–1.82)	0.12 (0.729)

Abbreviations: FDOH, Florida Department of Health; LR χ^2 , likelihood ratio χ^2.

[a]Ns for the univariate analyses vary across analyses due to differing levels of missing data across the different variables.

[b]Adjusted for gender, race, education, marital status, hurricane exposure, and work demand;

LR χ^2 = 27.97, *df* = 7, *P* < .001; Hosmer-Lemeshow goodness-of-fit χ^2 = 5.45, *df* = 8, *P* = .708

TABLE 3

Relationship of Possible Risk Factors to Increased Alcohol Use in FDOH Employees[a]

	Prevalence of Increased Alcohol Use, %		Crude[a]		Adjusted[b]	
			Likelihood of Increased Alcohol Use	Analysis	Likelihood of Increased Alcohol Use	Analysis
Risk Factor	**Employees With Risk Factor**	**Employees Without Risk Factor**	**Odds Ratio (95% CI)**	**LR χ^2 (*df* = 1) (*P*)**	**Odds Ratio (95% CI)**	**LR χ^2 (*df* = 1) (*P*)**
Increased Alcohol Use						
Female	7.4	5.7	1.34 (0.73–2.46)	0.96 (0.326)	1.43 (0.75–2.73)	1.23 (0.267)
White	7.2	6.6	1.10 (0.55–2.20)	0.07 (0.785)	1.18 (0.57–2.44)	0.21 (0.649)
Younger (< 49 y)	7.7	6.3	1.23 (0.75–2.02)	0.69 (0.408)	1.20 (0.72–2.02)	0.48 (0.487)
Education < BA/BS	6.1	7.7	0.78 (0.47–1.31)	0.90 (0.344)	1.52 (0.87–2.65)	2.24 (0.135)
Nonmarried	9.3	6.0	1.61 (0.99–2.63)	3.54 (0.060)	1.53 (0.91–2.57)	2.55 (0.110)
Exposure	14.9	5.5	3.01 (1.78–5.10)	15.06 (< 0.001)	3.09 (1.77–5.38)	14.47 (< 0.001)
Work demand	10.0	5.3	1.98 (1.22–3.23)	7.54 (0.006)	1.70 (1.01–2.85)	4.01 (0.045)

Abbreviations: FDOH, Florida Department of Health; LR χ^2 , likelihood ratio χ^2.

[a] Ns for the univariate analyses vary across analyses due to differing levels of missing data across the different variables.

[b] Adjusted for gender, race, education, marital status, hurricane exposure, and work demand;

LR χ^2 = 27.46, *df* = 7, *P* < .001; Hosmer-Lemeshow goodness-of-fit χ^2 = 13.25, *df* = 8,*P* = 0.104

TABLE 4

Relationship of Possible Risk Factors to Increased Tobacco Use in FDOH Employees[a]

	Prevalence of Increased Tobacco Use, %		Crude[a]		Adjusted[b]	
			Likelihood of Increased Tobacco Use	Analysis	Likelihood of Increased Tobacco Use	Analysis
Risk Factor	**Employees With Risk Factor**	**Employees Without Risk Factor**	**Odds Ratio (95% CI)**	**LR χ^2 (*df* = 1) (*P*)**	**Odds Ratio (95% CI)**	**LR χ^2 (*df* = 1) (*P*)**
Increased Tobacco Use						
Female	24.0	17.5	1.49 (0.78–2.84)	1.52 (0.218)	1.81 (0.87–3.77)	2.63 (0.105)
White	22.9	20.3	1.17 (0.58–2.34)	0.19 (0.663)	1.48 (0.69–3.14)	1.06 (0.302)
Younger (< 49 y)	24.9	20.0	1.32 (0.78–2.24)	1.09 (0.296)	1.45 (0.82–2.55)	1.63 (0.201)
Education < BA/BS	20.8	24.4	0.81 (0.48–1.39)	0.57 (0.451)	1.29 (0.70–2.38)	0.68 (0.409)
Nonmarried	23.5	21.1	1.15 (0.68–1.93)	0.27 (0.606)	1.03 (0.58–1.83)	0.01 (0.924)
Exposure	41.9	17.5	3.40 (1.87–6.15)	15.57 (< 0.001)	3.23 (1.71–6.12)	12.66 (< 0.001)
Work demand	31.7	18.1	2.10 (1.23–3.61)	7.19 (0.007)	2.11 (1.15–3.85)	5.77 (0.016)

Abbreviations: FDOH, Florida Department of Health; LR χ^2 , likelihood ratio χ^2.

[a] Ns for the univariate analyses vary across analyses due to differing levels of missing data across the different variables.

[b] Adjusted for gender, race, education, marital status, hurricane exposure, and work demand;

R χ^2 = 27.32, *df* = 7, *P* < .001; Hosmer-Lemeshow goodness-of-fit χ^2 = 2.83, *df* = 8, *P* = .945

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