

Mental Health Disorders, Organizational Stigma, and Health Service Utilization Among US Fire Investigators

A Cross-sectional Survey

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Objective: The aim of the study is to estimate in a sample of US fire investigators the (1) prevalence of generalized anxiety disorder (GAD), depression, post-traumatic stress disorder (PTSD) risk, and mental health services use and (2) association between organizational stigma and mental health disorders. **Methods:** This is a cross-sectional study design used to administer between November 2023 and January 2024, a 35-item behavioral/mental health survey. **Results:** Approximately 18.0% of fire investigators had GAD, 22.8% depression, and 18.2% PTSD risk. Organizational stigma about mental health disorders was reported by 53.3% of fire investigators. The most frequently used behavioral/mental health services were cognitive behavioral therapy (40.1%) and medication management (36.1%). Organizational stigma around reporting mental health disorders was significantly associated with PTSD risk (adjusted odds ratio = 5.25 [2.41–11.43]). **Conclusions:** Mental health disorders are present in the fire investigator workforce, and organizational stigma is associated with limited report of PTSD risk.

Keywords: fire investigators, mental health, generalized anxiety disorder, depression, posttraumatic stress disorder

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LEARNING OUTCOMES

- Describe the prevalence of generalized anxiety disorder, depression, and posttraumatic stress disorder risk in a sample of US fire investigators.
- Explain how organizational stigma is associated with reporting of mental health disorders in US fire investigators.
- Compare the type of behavioral and mental health services used by US fire investigators.

Fire investigators, a subgroup of the overall fire service workforce, determine the origin and cause of fire incidents.¹ Their primary worksite functions require securing the fire scene and collecting physical evidence around the fire origin.¹ There is very limited scientific information available on the health and safety of US fire investigators. The National Fire Protection Association estimated that in 2020, there were approximately 1,041,200 career and volunteer firefighters, of whom 676,900 (65%) were volunteer firefighters.² In the same year, the US Bureau of Labor Statistics estimated there were 12,400 US fire investigators, a small fraction of the overall fire service.³ While a significant amount of occupational health and safety research has been conducted in structural firefighting and increasingly in wildland and volunteer firefighters,^{4–7} there is a dearth of scientific information about the fire investigator workforce. For example, there is no health information on cardiovascular disease, cancer risk, musculoskeletal disorders, behavioral/mental health, and personal protective safety practices among fire investigators. To date, there is only one known publication on fire investigator health and safety focused on environmental sampling of airborne contaminants during hot, warm and cold scene investigations.⁸

In the course of a fire investigation, fire investigators may encounter human remains particularly if the cause of the fire is related to criminal activity, arson, or other suspicious circumstances.^{9–11} Similar to their firefighter peers, irregular work hours, tenure of service, and response to traumatic events may influence the development of sleep disorders and mental health disorders, including anxiety, depression, posttraumatic stress disorder (PTSD), and psychological distress.^{12–17} Despite the known mental health and psychosocial impacts documented among structural firefighter peers,^{18–22} no literature exists characterizing the behavioral and mental health experience of fire investigators nor any potential barriers to seeking mental health support. In the firefighter and broader first responder workforce, recent studies have documented fear of confidentiality and negative career impact as barriers to seeking mental health treatment.^{23,24} It may be possible that there is a fear of reporting behavioral and mental health issues among fire investigators necessitating research into the mental health conditions and traumatic exposures encountered by fire investigators.

Workforce stigma and other barriers to healthcare utilization may contribute to underreporting of mental health disorders among fire investigators. Use of employer provided healthcare services for mental health may be influenced by various concerns including fears of breach in confidentiality, peer perception, quality of care, and employment security. Similar to their structural firefighter peers, irregular work hours held by fire investigators may limit scheduling opportunities for them to seek care.²³ Gulliver et al found that while most firefighters had knowledge of existing mental health services in their department, few would recommend using them and would rather seek help from family or utilize private services.²⁵ It is important to note that fire investigators can work in the public, private, or both sectors, and it is unknown if differences in quality of care and accessibility to mental health services exist between the different sectors. Perceived barriers to healthcare utilization such as accessibility, cost, and stigma contrast starkly between volunteer and career firefighters, however differences between sectors of the fire investigator workforce are unknown.²⁶

In this analysis, we estimate in a sample of US fire investigators the (1) prevalence of self-reported generalized anxiety disorder (GAD), depression, PTSD risk, and mental health services use and (2) association between organizational stigma and mental health disorders. We hypothesize that fire investigators who report organizational stigma will be more likely to report a mental health disorder.

MATERIALS AND METHODS

Study Design and Sample

We used a cross-sectional study design to administer a 35-item behavioral and mental health survey to a sample of fire investigators between November 2023 and January 2024. The primary goal was to collect information regarding self-reported GAD, depression, and the risk of PTSD. Survey measures also assessed for organizational stigma about reporting mental health disorders and individual utilization of behavioral and mental health support services. Individuals who were or are actively employed as fire investigators, were 18 years or older, and can read and write in English were eligible to participate. Fire investigators that work in both the public and private sectors were included in the sample.

Participant Recruitment and Survey Administration

The survey was distributed via email listserv to the membership of the International Association of Arson Investigators (IAAI), comprised of approximately 11,300 individuals including international investigators but predominately US fire investigators. The study flyer was also published on IAAI social media (ie, Facebook). A total of 631 fire investigators that satisfied inclusion and exclusion criteria were consented to and completed the survey (response rate = 5.58%). The Research Electronic Data Capture (REDCap) portal was used to administer the consent form, prescreener, and survey. No personal identifiable information was collected. The protocol (#20231096) was approved by the University of Miami Institutional Review Board (IRB).

Study Outcome Measures

The behavioral and mental health survey incorporated three validated screeners designed to assess for GAD, depression, and PTSD risk.^{27–29} GAD was assessed using the seven-item Generalized Anxiety Disorder screener (GAD-7), employing a four-point Likert scale with response options from “(0) not at all” to “(3) nearly every day” during the past 2 weeks. Participant responses were summed, with a possible score range between 0 and 21, and a cutoff score of 10 or greater indicated moderate anxiety. At a 10-point cutoff the GAD-7 has a sensitivity of 89% and a specificity of 82% for GAD.²⁷ The Patient Health Questionnaire (PHQ-8) is an eight-item screener utilizing a four-point Likert scale with response options from

“(0) not at all” to “(3) nearly every day” over the past 2 weeks. Participant responses were summed, with a possible score range 0–24, and a cutoff score of 10 or greater indicates major depression.³⁰ The five-item PC-PTSD-5 evaluated participant PTSD risk. Response options were “(1) yes” and “(0) no” with a possible score range between 0 and 5. A summed score of 4 or more was considered risk for PTSD. Using a four-point cutoff, the PC-PTSD-5 has a sensitivity of 78% and a specificity of 91% among US veterans.³¹

Other study measures included sociodemographic information, type of fire investigator (private, public, and both), organizational stigma in seeking mental health services, and individual utilization of behavioral or mental health support services. Type of fire investigator was assessed by the question, “Please indicate how long you have worked in any of the fire investigator roles. If you have never worked in any of these roles, select zero.” Participants recorded the number of years served as a public or private investigator. Participants that answered both questions were considered “both private and public,” while participants that answered either question were classified as a private or public fire investigator. Stigma for seeking mental health services was assessed using the question, “During your career as a fire investigator, did you ever feel there was a stigma or label in the profession around using mental/behavioral health therapies for a work-related issue?” with responses options, “yes” or “no.” The individual use of mental health support services was assessed with question, “Please indicate if you have EVER used any of the following mental/behavioral health therapies for a work-related issue: (Check all that apply).” Response options included “I have NEVER used a mental / behavioral health service for a work-related issue,” “cognitive behavioral therapy,” “group therapy,” “medication management,” “eye movement desensitization,” “processing or addiction therapy,” and “other.” In addition, the Behavioral Risk Factor Surveillance System question “Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?” was included.

Statistical Analysis

A total of 631 surveys were collected. Fire investigators that were retired or worked internationally were excluded from the final analytic dataset ($n = 116$, 18.4%) leading to $N = 515$ US working fire investigators. Descriptive statistics were recorded as frequency and percent for categorical variables and as a median with interquartile range or mean $\pm$ standard deviation for continuous variables. The association between mental health disorders and categorical variables was determined using chi-squared or Fisher’s exact test. Independent two-sample Student’s t test were used for comparing means of continuous variables. Univariate and multivariate binary logistic regression models for each dichotomous mental health disorder screeners (present vs absent) were used to estimate the association between mental health disorders and sociodemographic characteristics, organizational stigma, and utilization of behavioral and mental health support services. Mental health disorders were stratified by participant gender. Associations were quantified with estimates for unadjusted odds ratio (uOR) and adjusted odds ratio (aOR) with corresponding 95% confidence intervals (95%CI). Data management, missing analysis and all other statistical analyses were performed using SPSS version 28 (IBM Corp., Armonk, NY). This manuscript and reported results adheres to the Strengthening of Reporting of Observational Studies in Epidemiology (STROBE) statement (Supplemental Digital Content, <http://links.lww.com/JOM/B637>).³²

RESULTS

Descriptive Statistics

Among the 515 fire investigators, participant age ranged from 22 to 80 years with a mean age of 49.2 (standard deviation = 10.1)

and were predominately male (90.7%), White race (94.5%), and non-Hispanic ethnicity (95.9%) (Table 1). Sociodemographic and mental health disorders were not significantly different by gender, except for participant age where a greater proportion of female fire investigators were in younger age groups compared with their male counterparts (Table 2). Approximately 18.0% of fire investigators have GAD, 22.8% depression, and 18.2% PTSD risk (Table 3). Participants reported working in three different sectors including public investigation (72.7%), private investigation (3.6%), and both (23.7%). Stigma in the profession around using mental/behavioral health services for work related events was reported by 53.3% of fire investigators. The top three most frequently used behavioral and mental health services were cognitive behavioral therapy (40.1%), medication management (36.1%), and group therapy (33.2%) (Fig. 1).

Generalized Anxiety Disorder

Compared with fire investigators that did not have GAD, fire investigators that did have GAD were significantly more represented among those who were 40–49 years old (45.6% vs 35.4%;

$P < 0.001$), Hispanic (9.2% vs 2.9%; $P = 0.014$), those who reported organizational stigma (66.7% vs 50.5%; $P = 0.005$), those who previously reported use of mental health services (51.1% vs 37.6%; $P = 0.018$), depression (80.9% vs 9.7%; $P < 0.001$), and PTSD risk (52.3% vs 10.4%; $P < 0.001$). In the univariate model, fire investigators who were 20–29 years old ($uOR = 11.50$; 95% CI 1.69–78.39, $P = 0.013$), 30–39 years old (10.35; 2.26–47.31; $P = 0.003$), 40–49 years old (9.76; 2.29–41.50; $P = 0.002$), and 50–59 years old (7.30; 1.69–31.50; $P = 0.008$) were significantly more likely to report GAD (Table 4). Fire investigators that were Hispanic ethnicity (3.33; 1.32–8.42; $P = 0.011$); previously utilized behavioral and mental health services (1.73; 1.09–2.75; $P = 0.019$); had depression (39.34; 21.05–73.54; $P < 0.001$); and PTSD risk (9.41; 5.56–15.94; $P < 0.001$) were also significantly more likely to report GAD. From a multivariate binary logistic regression model resulted significant association with age groups for 30–39 years old ($aOR = 16.20$; 95% CI 2.23–117.62; $P = 0.006$), 40–49 years old (9.73; 1.46–64.98; $P = 0.019$), and 50–59 years old (8.88; 1.34–59.04; $P = 0.024$) compared with those 60 years and older. The same model also yielded both depression

TABLE 1. Sociodemographic, Occupational Characteristics, and Mental Health Service Utilization Stratified by Mental Health Disorders Among US Fire Investigators ($N = 515$)

Characteristics	Total Sample n (%) [*]	Yes GAD n (%) [*]	No GAD n (%) [*]	<i>P</i>	Yes Depression n (%) [*]	No Depression n (%) [*]	<i>P</i>	Yes PTSD n (%) [*]	No PTSD n (%) [*]	<i>P</i>
All fire investigators	515 (100.0)	90 (18.0)	411 (82.0)		112 (22.8)	380 (77.2)		92 (18.2)	413 (81.8)	
Age groups (yr)										
20–29	12 (2.3)	3 (3.3)	9 (2.2)	0.005	<u>3 (2.7)</u>	<u>8 (2.1)</u>	0.022	<u>3 (3.3)</u>	<u>8 (1.9)</u>	0.517
30–39	67 (13.0)	15 (16.7)	50 (12.2)		<u>14 (12.5)</u>	<u>50 (13.2)</u>		<u>15 (16.3)</u>	<u>52 (12.6)</u>	
40–49	189 (36.8)	41 (45.6)	145 (35.4)		<u>55 (49.1)</u>	<u>129 (34.0)</u>		<u>37 (40.2)</u>	<u>129 (35.9)</u>	
50–59	172 (33.5)	29 (32.2)	137 (33.4)		<u>32 (28.6)</u>	<u>130 (34.3)</u>		<u>27 (29.3)</u>	<u>142 (34.5)</u>	
60 and older	74 (14.4)	2 (2.2)	69 (16.8)		8 (7.1)	62 (16.4)		10 (10.9)	62 (15.1)	
Gender										
Male	449 (90.7)	79 (90.8)	357 (90.6)	0.955	<u>97 (92.4)</u>	<u>336 (91.1)</u>	0.670	<u>82 (93.2)</u>	<u>360 (90.7)</u>	0.455
Female	46 (9.3)	8 (9.2)	37 (9.4)		8 (7.6)	33 (8.9)		6 (6.8)	37 (9.3)	
Race										
White	481 (94.5)	85 (95.5)	383 (94.3)	0.822	<u>106 (95.5)</u>	<u>354 (94.2)</u>	0.770	<u>84 (93.3)</u>	<u>388 (94.9)</u>	0.260
Black	6 (1.2)	0 (0.0)	6 (1.5)		<u>0 (0.0)</u>	<u>5 (1.3)</u>		<u>0 (0.0)</u>	<u>6 (1.4)</u>	
Other	22 (4.3)	4 (4.5)	17 (4.2)		5 (4.5)	17 (4.5)		6 (6.7)	15 (3.7)	
Ethnicity										
Hispanic	21 (4.1)	8 (9.2)	12 (2.9)	0.014	<u>7 (6.4)</u>	<u>12 (3.2)</u>	0.157	<u>6 (6.7)</u>	<u>14 (3.4)</u>	0.145
Non-Hispanic	487 (95.9)	79 (90.8)	395 (97.1)		102 (93.6)	364 (96.8)		83 (93.3)	396 (96.6)	
Investigator type										
Public	368 (72.7)	66 (74.2)	289 (71.7)	0.386	<u>84 (75.7)</u>	<u>267 (71.8)</u>	0.662	<u>64 (71.1)</u>	<u>298 (73.4)</u>	0.560
Private	18 (3.6)	5 (5.6)	13 (3.2)		<u>3 (2.7)</u>	<u>15 (4.0)</u>		<u>2 (2.2)</u>	<u>16 (3.9)</u>	
Both	120 (23.7)	18 (20.2)	101 (25.1)		24 (21.6)	90 (24.2)		24 (26.7)	92 (22.7)	
Perceived organizational stigma										
Yes	274 (53.3)	60 (66.7)	207 (50.5)	0.005	<u>80 (71.4)</u>	<u>181 (47.8)</u>	<0.001	<u>76 (82.6)</u>	<u>191 (46.4)</u>	<0.001
No	240 (46.7)	30 (33.3)	203 (49.5)		32 (28.6)	198 (52.2)		16 (17.4)	221 (53.6)	
Ever utilized mental health service										
Yes	202 (39.8)	46 (51.1)	152 (37.6)	0.018	<u>58 (52.3)</u>	<u>137 (36.6)</u>	0.003	<u>53 (58.2)</u>	<u>142 (34.9)</u>	<0.001
No	306 (60.2)	44 (48.9)	252 (62.4)		53 (47.7)	237 (63.4)		38 (41.8)	265 (65.1)	
Depression										
Yes	112 (22.8)	72 (80.9)	38 (9.7)	<0.001	=	=	-	<u>53 (60.2)</u>	<u>57 (14.4)</u>	<0.001
No	380 (77.2)	17 (19.1)	353 (90.3)		-	-		35 (39.8)	340 (85.6)	
GAD										
Yes	90 (18.0)	-	-	-	<u>72 (65.5)</u>	<u>17 (4.6)</u>	<0.001	<u>46 (52.3)</u>	<u>42 (10.4)</u>	<0.001
No	411 (82.0)	-	-		38 (34.5)	353 (95.4)		42 (47.7)	361 (89.6)	
PTSD risk										
Yes	92 (18.2)	46 (52.3)	42 (10.4)	<0.001	<u>53 (48.2)</u>	<u>35 (9.3)</u>	<0.001	=	=	-
No	413 (81.8)	42 (47.7)	361 (89.6)		57 (51.8)	340 (90.7)		-	-	
Days in last month mental health not good, median (25th%–75th%)	3 (3–10)	10 (6–20)	2 (0–5)	<0.001	12 (6–20)	2 (0–5)	<0.001	10 (5–15)	2 (0–5)	<0.001

Other race includes Asian, Native Indian Hawaiian/other Pacific Islander, American Indian/Alaskan Native, and other.

GAD, Generalized Anxiety Disorder; PTSD, posttraumatic stress disorder.

^{*}Differences in subtotal population sample due to item nonresponse or missing. *P* values were calculated with chi-squared or Fisher's exact test for association or two-sample Student's *t* test for mean.

TABLE 2. Sociodemographic, Occupational Characteristics, and Mental Health Disorders Stratified by Gender Among US Fire Investigators (*n* = 495)

Characteristics	Total Sample n (%) [*]	Male n (%) [*]	Female n (%) [*]	<i>P</i> Value [*]
Row total	495 (100.0)	449 (87.2)	46 (8.9)	
Age groups (yr)				0.007
20–29	12 (2.4)	9 (2.0)	3 (6.5)	
30–39	67 (13.6)	57 (12.7)	10 (21.7)	
40–49	178 (36.0)	157 (35.0)	21 (45.7)	
50–59	166 (33.6)	155 (34.6)	11 (23.9)	
60 and older	71 (14.4)	70 (15.6)	1 (2.2)	
Race				1.00
White	462 (94.3)	418 (94.1)	44 (95.7)	
Black	6 (1.2)	6 (1.4)	0 (0.0)	
Other	22 (4.5)	20 (4.5)	2 (4.3)	
Ethnicity				0.118
Hispanic	21 (4.3)	17 (3.8)	4 (8.9)	
Non-Hispanic	467 (95.7)	426 (96.2)	41 (91.1)	
Investigator type				0.154
Public	353 (72.6)	322 (73.0)	31 (68.9)	
Private	18 (3.7)	14 (3.2)	4 (8.9)	
Both	115 (23.7)	105 (23.8)	10 (22.2)	
Perceived organizational stigma				0.302
Yes	265 (53.6)	237 (52.9)	28 (60.9)	
No	229 (46.4)	211 (47.1)	18 (39.1)	
Ever utilized mental health services				0.265
Yes	196 (40.2)	174 (39.4)	22 (47.8)	
No	292 (59.8)	268 (60.6)	24 (52.2)	
Depression				0.670
Yes	369 (77.8)	97 (22.4)	33 (80.5)	
No	105 (22.2)	336 (77.6)	8 (19.5)	
GAD				0.955
Yes	394 (81.9)	357 (81.9)	37 (82.2)	
No	87 (18.1)	79 (18.1)	8 (17.8)	
PTSD risk				0.455
Yes	88 (18.1)	82 (18.6)	6 (14.0)	
No	397 (81.9)	360 (81.4)	37 (86.0)	
Days in last month mental health not good, median (25th%–75th%)	3 (0–10)	3 (0–10)	3 (1–6)	0.574

Other race includes Asian, Native Indian Hawaiian/other Pacific Islander, American Indian/Alaskan Native, and other.

GAD, Generalized Anxiety Disorder; PTSD, posttraumatic stress disorder.

^{*}Differences in subtotal population sample due to item nonresponse or missing. *P* values were calculated with chi-squared or Fisher's exact test for association or two-sample Student's *t* test for continuous variables.

(20.16; 9.22–44.08; *P* < 0.001) and PTSD risk (4.18; 1.83–9.57; *P* < 0.001) as significant predictors of GAD.

Depression

Fire investigators with depression were significantly more represented among those 40–49 years old (49.1% vs 34.0%; *P* = 0.022), those who reported organizational stigma, who previously used behavioral and mental health services (52.3% vs 36.6%; *P* = 0.003), reported GAD (65.5% vs 4.6%; *P* < 0.001), and were at PTSD risk (48.2% vs 9.3%; *P* < 0.001). The univariate binary logistic model estimated that those 40–49 years old (3.30; 1.48–7.36; *P* = 0.003); having used behavior or mental health services (1.83; 1.23–2.91; *P* = 0.003); GAD (39.34; 21.05–73.54; *P* < 0.001); and PTSD risk (9.03; 5.42–15.05; *P* < 0.001) were significantly more likely to report depression. In the multivariate binary logistic regression model, PTSD risk versus no PTSD risk (aOR = 2.77 [1.29–5.94]; *P* = 0.009) and having GAD versus not having GAD (19.60; 20.92–87.88; *P* < 0.001) remained significantly associated with depression after controlling for covariates.

PTSD Risk

PTSD risk was significantly more represented among fire investigators that reported organizational stigma (82.6% vs 46.4% *P* < 0.001), had previously used behavioral or mental health services (58.2% vs 34.9%; *P* < 0.001), had depression (60.2% vs 14.4%

P < 0.001), and GAD (52.3% vs 10.4%; <0.001). In the univariate binary logistic regression model, organizational stigma (uOR = 5.50 [3.01–9.75]; *P* < 0.001); having ever used behavioral or mental health services (2.60; 1.64–4.14; *P* < 0.001); GAD (9.41; 5.56–15.94; *P* < 0.001); and depression (9.03; 5.42–15.05; *P* < 0.001) were significantly associated with PTSD risk. Organizational stigma versus no organizational stigma (aOR = 5.25 [2.41–11.43]; *P* < 0.001); having depression versus no depression (2.79; 1.28–6.06; *P* = 0.010); and having GAD versus not having GAD (4.01; 1.80–8.93; *P* < 0.001) remained significantly associated with PTSD risk after controlling for covariates.

DISCUSSION

We documented the first time that US fire investigators experience and report elevated rates of GAD, depression, and PTSD risk. Those that reported a mental health disorder were significantly more likely to have a comorbid mental health disorder. Furthermore, those with PTSD risk were significantly more likely to report organizational stigma around reporting mental health disorders. In this study, more than half of the participating fire investigators reported organizational stigma regarding use of mental health services given their experiences on the job and nearly 40% used some type of mental or behavioral health service. Among all the mental health services used by fire

TABLE 3. Summary of Study Outcome Measurements From a Mental Health SURVEY Among US Fire Investigators

Mental Health Disorder Outcomes	All Fire Investigators (N = 515)
GAD-7 anxiety sum score^a	
Mean (SD)	5.1 (4.9)
Median (25th%–75th%)	4 (1–8)
Min–max	0–21
Anxiety	
Present	90 (18.0)
Absent	411 (82.0)
PHQ-8 depression sum score	
Mean (SD)	5.7 (5.1)
Median (25th%–75th%)	4 (2–9)
Min–max	0–24
Depression	
Present	112 (22.8%)
Absent	380 (77.2%)
PC-PTSD-5 sum score	
Mean (SD)	1.8 (1.7)
Median (25th%–75th%)	1 (0–3)
Min–max	0–5
PTSD	
Present	92 (18.2%)
Absent	413 (81.8%)
Presence of any mental health disorder	
None	320 (67.7%)
At least one	153 (32.3%)
No. any mental health disorder	
0	320 (67.7%)
1	68 (14.4%)
2	44 (9.3%)
3	41 (8.7%)

GAD, Generalized Anxiety Disorder; PTSD: posttraumatic stress disorder; SD, standard deviation.

^aGeneralized Anxiety Disorder is a seven-item screener utilizing a four-point Likert scale with response options from “not at all” to “nearly every day” during the past 2 weeks. A cutoff score of 10 or greater indicated moderate anxiety.

^bThe Patient Health Questionnaire is an eight-item screener utilizing a four-point Likert scale with response options from “not at all” to “nearly every day” over the past 2 weeks. A cutoff score of 10 or greater indicates major depression.

^cThe five-item PC-PTSD-5 is a five-item screener utilizing a response option with “yes” and “no.” A summed score of 4 or more was considered risk for PTSD.

investigators, cognitive behavioral therapy was the most frequently used and over a third used medication management.

The prevalence of psychiatric disorders in the broad firefighter workforce is variable.^{33,34} For example, studies on the mental health of firefighters among those in career and volunteer roles have estimated PTSD and depression to range from 5.4% to 37.0% and 22.0% to 39.7%, respectively.^{33–35} In a longitudinal study of American firefighters by Gulliver et al, they documented through clinical interview a range of GAD between 0.57%–1.1% occurring within their first 3 years of service.³⁶ In a cross-sectional study of Canadian firefighters, 11.7% screened positive for GAD using the GAD-7 screener with a cutoff score of greater than 9.³⁷ These rates on psychiatric disorders in the fire service contrast with those of the general US population where the American Psychological Association estimates the prevalence of PTSD at 3.5% and major depressive disorder around 7% for adults.³⁸ These rates further contrast starkly for fire investigators that were younger, reported organizational stigma, and used mental or behavioral health services. Variations in these rates may be due to the type of workplace exposure encountered at the fire scene, frequency attending fire scenes, or due to access of screening, diagnostic and treatment mental health services by fire investigators.

Fire investigators that reported a mental health disorder were significantly more likely to have a comorbid mental health disorder.

This finding is consistent with other studies on mental health among structural firefighters. Zegel et al found firefighters with probable PTSD and firefighters with comorbid alcohol use disorder and probable PTSD had significantly higher depressive symptom scores than trauma-only exposed firefighters.³⁹ They reported 10.5% with probable clinical depression and 9.7% with probable PTSD. Similarly, Chiu et al found significant PTSD and depression comorbidity in firefighters that responded to the World Trade Center.⁴⁰ These findings highlight the need to routinely screen and evaluate the mental health status throughout the career of a fire investigator, especially younger fire investigators who were significantly more likely to report GAD.

We did not ascertain the availability of behavioral and mental health services provided by fire agencies employing the fire investigators, regardless of the mental health conditions reported by the investigators. However, we found a greater number of fire investigators with PTSD risk who reported organizational/agency stigma. Kim et al documented that among the general firefighter workforce, nearly 10.0% of those with probable PTSD reported receiving mental health services.³³ Those firefighters reported stigma and perceived treatment accessibility as barriers to seeking mental health treatment. In our study, those that did access mental healthcare services reported use of varying services, with cognitive behavioral services being the most frequently used. Studies in the broader US population have documented that stigma can impede help-seeking behaviors with an inverse relationship documented between stigma and treatment seeking, adherence, and continuation.⁴¹

The present analysis of survey data is not without limitations. The IAAI has a membership estimated at 11,300, yet only 631 surveys were completed, a relatively low response rate. This could suggest self-selection bias in that only IAAI members with mental health conditions responded to the survey request, thus potentially limiting the external generalizability of the study findings to the entire US fire investigator workforce. Survey data is self-reported and not validated against a medical record which could impact the sample prevalence of medical health conditions truly experienced by the investigators. Some of the results should be interpreted with caution given wider confidence interval widths due to the small sample size in some of the characteristics. Of note, due to the cross-sectional nature of the study design, causation cannot be inferred as we do not know if the job exposures gave rise to any mental health disorder or if the mental health disorder existed before employment. However, given that our study is considered as the first to evaluate mental health disorders among fire investigators, the results can be used for designing future studies.

Despite these limitations, there are several strengths to note in this study. The findings of this research project are the first to ever

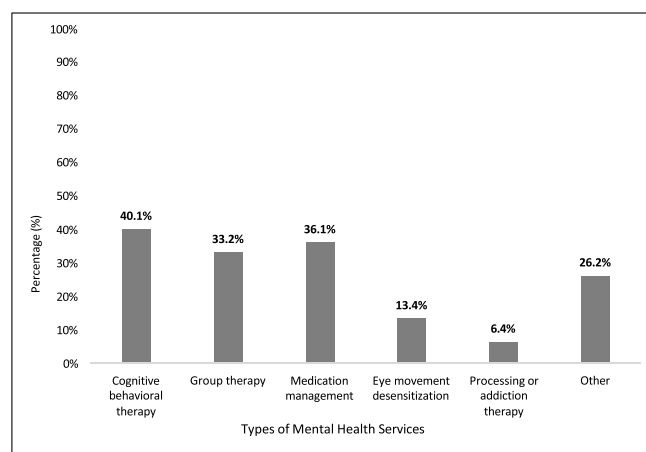


FIGURE 1. Type of mental health services used among a sample of fire Investigators who indicated previously using mental health services ($n = 202$ out of 515).

TABLE 4. Univariate and Multivariate Binary Logistic Regression Models for Presence of Mental Health Disorder (Generalized Anxiety Disorder, Depression, PTSD Risk) Among US Fire Investigators, N = 515

Characteristics	GAD UOR (95%CI)*	GAD AOR (95%CI)†	Depression UOR (95%CI)*	Depression AOR (95%CI)†	PTSD Risk UOR (95%CI)*	PTSD Risk AOR (95%CI)†
Age groups (ref = 60 yr and older)						
20–29 yr old	11.50 (1.69–78.39)	9.78 (0.68–140.59)	2.91 (0.64–13.26)	0.63 (0.06–6.93)	<u>2.33 (0.53–10.27)</u>	<u>2.22 (0.24–20.20)</u>
30–39 yr old	10.35 (2.26–47.31)	16.20 (2.23–117.62)	2.17 (0.84–5.58)	0.64 (0.16–2.51)	<u>1.79 (0.74–4.32)</u>	<u>1.79 (0.48–6.59)</u>
40–49 yr old	9.76 (2.29–41.50)	9.73 (1.46–64.98)	3.30 (1.48–7.36)	1.29 (0.41–4.09)	<u>1.55 (0.73–3.31)</u>	<u>1.55 (0.47–5.07)</u>
50–59 yr old	7.30 (1.69–31.50)	8.88 (1.34–59.04)	1.91 (0.83–4.38)	0.64 (0.20–2.09)	<u>1.18 (0.54–2.58)</u>	<u>1.66 (0.52–5.34)</u>
Gender (ref = male)						
Female	0.98 (0.44–2.18)	0.92 (0.23–3.75)	0.84 (0.38–1.88)	0.73 (0.20–2.71)	<u>0.71 (0.29–1.74)</u>	<u>0.62 (0.19–2.07)</u>
Ethnicity (ref = non-Hispanic)						
Hispanic	3.33 (1.32–8.42)	3.48 (0.71–17.12)	2.08 (0.80–5.42)	0.45 (0.09–2.25)	2.05 (0.76–5.48)	0.99 (0.27–3.67)
Investigator type (ref = Public)						
Private	1.68 (0.58–4.89)	5.18 (0.99–26.99)	0.64 (0.18–2.25)	0.23 (0.03–1.91)	0.58 (0.13–2.59)	0.36 (0.03–4.16)
Both	0.78 (0.44–1.38)	1.08 (0.40–2.91)	0.85 (0.51–1.42)	0.99 (0.42–2.36)	1.22 (0.72–2.05)	1.18 (0.55–2.53)
Perceived organizational stigma						
Yes	1.96 (1.22–3.17)	0.72 (0.32–1.60)	2.74 (1.73–4.32)	1.46 (0.70–3.06)	5.50 (3.01–9.75)	5.25 (2.41–11.43)
Ever utilized mental health service (ref = no)						
Yes	1.73 (1.09–2.75)	0.79 (0.38–1.67)	1.89 (1.23–2.90)	1.59 (0.81–3.12)	2.60 (1.64–4.14)	1.61 (0.88–2.98)
Depression (ref = no)						
Yes	39.34 (21.05–73.54)	20.16 (9.22–44.08)	-	-	9.03 (5.42–15.05)	2.79 (1.28–6.06)
PTSD risk (ref = no)						
Yes	9.41 (5.56–15.94)	4.18 (1.83–9.57)	9.03 (5.42–15.05)	2.77 (1.29–5.94)	-	-
GAD (ref = no)						
Yes	-	-	39.34 (21.05–73.54)	19.60 (9.18–43.42)	9.41 (5.56–15.94)	4.01 (1.80–8.93)
Days in last month mental health not good	1.15 (1.11–1.18)	1.08 (1.03–1.13)	1.17 (1.13–1.21)	1.10 (1.06–1.15)	1.10 (1.07–1.13)	1.03 (0.99–1.07)

*Ref = reference group; UOR (95% CI) = unadjusted odds ratio and the 95% confidence interval, CI.

†AOR (95% CI) = adjusted odds ratio and the 95% confidence interval.

GAD, Generalized Anxiety Disorder; PTSD, posttraumatic stress disorder.

document the mental health disorders experienced by fire investigators. The IAAI is one of the largest professional fire investigator organizations in the world representing a significantly large proportion of the overall fire investigator workforce who seek training, education and certification through the IAAI. Survey data was collected anonymously and through the university's web-based survey platform, which should encourage honest and candid survey responses from the fire investigators. Survey measures assessing for mental health disorders were consistent with those used in general population mental health survey assessments. This study is also significant in documenting healthcare seeking behaviors for mental health disorders in this understudied worker group, identifying potential workplace interventions to support access and utilization of mental health services.

Fire Investigators are a unique and understudied occupational subgroup of the fire service. During the postfire scene investigation process, fire investigators can be exposed to many harmful physical and psychological hazards including physical strain, human death and body remains.^{9–11} Repeated exposure to these traumatic events at fires, over time, increases mental health disorders and psychological distress. This study adds new and critical information on the mental health conditions and mental healthcare services accessed by fire investigators. Additional research is needed regarding surveillance of and workplace interventions for the specific mental health disorders prevalent in the fire investigator workforce.

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Survey data collected as part of this study is anonymous. Individuals interested in accessing the data should contact the International Association of Arson Investigators (Mr. Jeffrey L. Pauley). STROBE guidelines were followed.

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