

Original Research

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A Prospective Post-disaster Longitudinal Follow-up Study of Emotional and Psychosocial Outcomes of the Oklahoma City Bombing Rescue and Recovery Workers During the First Quarter Century Afterward

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Abstract

Objective: Little prospectively assessed post-disaster longitudinal research has been done on mental health (MH) outcomes of disaster rescue and recovery workers. This longitudinal prospective study, which is examining first responders to a terrorist bombing in Oklahoma City after nearly a quarter century, was conducted to investigate their long-term MH outcomes using full diagnostic assessments. This will most accurately inform planning for longitudinal MH care needs.

Methods: Longitudinal follow-up interviews of 124 rescue and recovery workers, from an original volunteer sample of 181 volunteer workers, were completed 3 years after the bombing, and reassessed 23 years after using consistent research methods. Structured diagnostic interviews were conducted at both assessments, but these were limited to posttraumatic stress disorder (PTSD) and major depressive disorder (MDD) with additional questions about alcohol use, problems, and major psychosocial problems of life at follow up.

Results: Initially, the rescue and recovery workers had a lower prevalence of post-disaster PTSD and MDD than directly exposed survivors. They also showed higher rates of PTSD than MDD. However, over time, PTSD increased a little while MDD increased 4-fold though fewer than 50% of the cases were remitted.

Conclusion: Low remission and increasing MDD provide incentives for surveillance and availability of treatment for decades after disaster, regardless of whether they were pre-existing conditions or disaster related.

Introduction

The short- and long-term mental health outcomes on disaster responders are of considerable importance to informing the need for mental health (MH) care to these workers. A recent systematic review,¹ found that the majority of MH literature has focused on disaster survivors, with only 57 articles focused on the MH of ‘disaster and humanitarian responders’ (p. 635) representing a wide range of responders including professional search-and-rescue workers, health care providers, and spontaneous volunteers. This review found that, like the literature on direct survivors, posttraumatic stress, and depression were the psychiatric conditions most often studied. The review found posttraumatic stress ranging from 0% - 34% and depression ranging from 21% - 53%. Due to the fact that the types of responders in this review were mixed, it is difficult to appreciate how the results might specifically represent first responders as they are the topic of the current article.

The occurrence of the September 11, 2001 (9/11) terrorist attacks on the World Trade Center in New York City was followed by intensive research on first responders. A study of 11678 rescue and recovery workers and volunteers, assessed in the early 9/11 post-disaster period as part of a health screening and treatment program using symptom screening assessments, found that 43% were referred for MH evaluation and treatment; with 44% screening positive for posttraumatic stress symptoms and 6% for depressive symptoms.²

There have been some other studies of first responders to disasters and terrorism. A research study on firefighters who served as rescue and recovery responders (almost all male) to a terrorist bombing in Oklahoma City, studied with structured diagnostic interviews assessing the full diagnostic criteria nearly 3 years after the disaster, found that 38% of male responders experienced any post-disaster psychiatric disorder.³ In that study, 13% developed bombing-related posttraumatic stress disorder (PTSD), which was significantly less than 23% of male survivors, and 34% of all survivors of the direct bomb blast who were also assessed by the same research

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team. Furthermore, 8% of the Oklahoma City male bombing responders, 3 years post-disaster, had current major depressive disorder (MDD) and 24% had current alcohol abuse/dependence. However, only 2% had developed a new (incident) alcohol abuse/dependence disorder.

A study of first responders to a terrorist bombing of the US Embassy in Nairobi, Kenya by this same research team, and using similar assessment instruments approximately 10 months after the bombing,⁴ found that 40% of male responders had any post-disaster disorder, including 22% with bombing-related PTSD and 27% with MDD. In sum, rescue, and recovery workers, using full diagnostic assessments, were found to have lower prevalence rates for psychiatric disorders than the above studies using self-report symptom scales.

Structured diagnostic interviews assessing the full criteria for psychiatric disorders are not often used in disaster research studies because of the research burden imposed by these instruments. As a result of this, most studies have instead relied on brief self-report symptom scales which have been well established to overestimate psychopathology.^{5,6} Thus, studies using diagnostic interviews are especially valuable. A study of 9/11 responders using a full diagnostic assessment 11–13 years after the disaster found that 18% had a history of 9/11-related PTSD while 10% of the responders were still present (not remitted).⁷ A large cohort of (> 91000) responders to the 9/11 attacks was assessed as part of a worker health care program, and a recent review of this work⁸ found that in the second decade after the attacks, 16% still had current MH problems of which 11% were with PTSD, 3% with depression, and 3% with anxiety disorder. These disorders were assessed using a combination of structured diagnostic interviews, self-report symptom checklists, and clinician assessments or mental health treatments at different points in time. Thus, information available on the long-term MH needs of first responders is not abundant and has been collected from 1 disaster, the 9/11 attacks.

Accurate data on MH consequences of disaster work among first responders is important for informing disaster-related MH care needs for these workers. Although the MH care needs of first responders have been examined most extensively in the early post-disaster time frame, there is little information about the long-term MH outcomes. Longitudinal research providing diagnostic assessment of the long-term course of disaster-related psychopathology among disaster responders is needed, and full diagnostic assessment is optimal. Therefore, this longitudinal prospective post-disaster study, examining first responders to a terrorist bombing after nearly a quarter of a century, was conducted to provide data demonstrating their long-term MH outcomes while using full diagnostic assessments to inform planning most accurately for longitudinal MH care needs.

Methods

The original study of 181 rescue and recovery workers from the Oklahoma City Fire Department ($n = 165$) and Tinker Air Force Base ($n = 16$) used a volunteer sample recruited through the notification of workers about the opportunity to participate in the study, which was circulated at the workplace. Details of the original study methods and characteristics of the sample and findings are provided in earlier publications.^{3,9} Longitudinal follow-up interviews of 124 rescue and recovery workers from the original sample were completed between February 1, 2017 and October 9, 2018, at a median of 23 years (range, 22.8–23.5 years) after the bombing. Follow-up interviews were completed by 124 of the baseline sample

(70% of the 176 not known to be deceased) and [Table 1](#) lists the numbers of deceased, unlocated, and declining participation.

The interviews were conducted by MH professionals formally trained on the study instruments. They administered the Diagnostic Interview Schedule for *DSM-IV* (DIS-IV), a structured interview assessing full diagnostic criteria,¹⁰ for PTSD, MDD, and alcohol use disorder sections at follow up as well as panic disorder, generalized anxiety disorder, alcohol use disorder, and drug use disorder at baseline. Combined variables were created to represent any specific diagnoses or any diagnosis either at baseline or follow-up assessment. Onset and recency questions for these psychiatric disorders were keyed to the date of the event, thus, allowing creation of lifetime pre-disaster and post-disaster prevalence variables (i.e., at any time prior to the disaster and at any time since the disaster, respectively) from which incident variables were generated to indicate occurrence for the first time after the disaster. The Disaster Supplement,¹¹ which was audio recorded and professionally transcribed, assessed bombing trauma exposure, and broad aspects of disaster experience, personal and emotional reactions, and long-term personal problems, using open-ended questions.

The Institutional Review Board (IRB) approval for the baseline study, and the longitudinal follow-up study (#96-0238), was provided at Washington University on June 12, 1996. The follow-up study (#092015-024) was approved by the IRB authority of the University of Texas Southwestern on April 27, 2017. All participants provided written informed consent at the time of recruitment for each of the interviews.

Data analysis

Analysis of data was conducted using SAS 9.4 (SAS Institute, Cary, NC). The findings are summarized as raw counts and percentages, means, and standard deviations (SD). For bivariate analysis, chi-squared tests were used for comparison of dichotomous variables and Student's *t*-tests for comparison of dichotomous and numeric variables. Illustrative quotes accompanying the categorical questions, as relevant, are included to provide further depth of information.

Results

[Table 1](#) provides the demographic characteristics of the follow-up study of firefighters, all of whom participated in rescue and recovery operations. About 10% were injured in these efforts. A third (34%, $n = 43$; not shown in table) had thought that they might die in the rescue and recovery operations. Based on data collected from the firefighters at baseline, the follow-up sample was almost all male and predominantly racial/ethnic non-minority in identification. The firefighters had a median age of 39, most were not college-educated, and 75% were married at baseline. The follow-up sample of firefighters did not differ from the remainder of the baseline firefighter sample in sex, age, race/ethnicity, and education, as well as marital status, injury in the bombing, emotional responses to the disaster (upset, harm, recovery), or pre-disaster and post-disaster psychiatric disorders identified at baseline.

Nearly 50% of the firefighter sample (46%, $n = 57$) had retired at follow up. All but 1 of the remainder were currently employed, none were disabled, and only 3% ($n = 4$) reported that they had experienced long periods of time when they could not work because of the bombing. Of the firefighters who were married at baseline, 84% ($n = 80$) were married at follow up, with most of the remainder being divorced (13%, $n = 12$). Of the 29 firefighters

Table 1. Demographic characteristics of the disaster worker follow-up sample

N = 124 (of 181)	
Baseline participants known to be deceased at follow up: % (n)	3% (5)
Baseline participants not located: % (n)	19% (35)
Baseline participants who declined follow-up participation: % (n)	9% (17)
Follow-up participation among baseline participants not identified as deceased: % (n)	70% (124)
Demographics (baseline data)	
Male sex: % (n)	98% (121)
Racial/ethnic non-minority: % (n)	90% (112)
Years of age: mean (SD), range: % (n)	39.0 (7.7), 22-63
College graduate: % (n)	15% (19)
Currently employed: % (n)	100% (124)
Married: % (n)	77% (95)
Injured in bombing: % (n)	10% (12)

who were not married at baseline, 27 had married during the intervening years, and 63% (n = 17) of those who had married since baseline were still married. A total of 78% (n = 97) were currently married at follow up.

The tasks for these rescue workers were dangerous and grueling. The workers described going ‘into the basement, crawling through all the rubble, trying to find victims; they were deep inside the structure’ in a site that ‘looked like you’d taken that building and put it inside of a blender on the inside.’ This was further explained as similar to ‘crawling through a war zone, listening for people calling out to us.’ As time went on, rescues became more involved and intricate, with some gruesome descriptions of rescuing people from underneath piles of debris and having to amputate limbs to free survivors. There were also subsequent bomb scares interrupting the recovery phase of the operation and causing workers to have to leave survivors until it was safe to return to them, which was heart-wrenching: ‘A couple of people were crying and saying, ‘*please don’t leave us, please don’t leave us.*’ Some attempts to save lives, however, were tragically unsuccessful, which the workers described as overwhelming and heartbreaking.

Table 2 presents findings pertaining to the firefighters’ emotional and social effects of the bombing. Overall, their emotional reactions had diminished but not disappeared in the intervening years. At baseline, nearly 50% of the follow-up survivor sample described themselves as ‘very upset’ about the bombing, but at follow up this proportion had declined to 10%. Of those who were ‘very upset’ at baseline, only 11% (n = 6) had the same response at follow up; however, 9% (n = 6) of the firefighters who were not ‘very upset’ at baseline reported feeling ‘very upset’ at follow up. At baseline, few of the follow-up sample of firefighters described themselves as harmed a great deal by the bombing, and this proportion had further declined by follow up. Of those who reported at baseline that they felt harmed a great deal by the bombing, 71% (n = 15) no longer felt this way, but another 2% (n = 2) of those who did not feel harmed a great deal at baseline reported this feeling at follow up. At baseline, more than 66% of the follow-up sample of firefighters reported feeling recovered from the bombing, but by follow up, this proportion had not increased. Of those who reported not feeling recovered at baseline, 50%

Table 2. Emotional and social effects of the bombing, and psychiatric disorders among disaster workers

Psychosocial variables	N = 124
<i>Emotional reactions to the bombing</i>	
Feels very upset about the bombing: % (n)	
Baseline	46% (57)
Follow up	10% (12)
Harmed a great deal by the bombing: % (n)	
Baseline	17% (21)
Follow up	6% (8)
Recovered from the bombing: % (n)	
Baseline	70% (86)
Follow up	66% (82)
<i>Bombing-related long-term personal problems: % (n)</i>	43% (53)
Mental health	30% (37)
Physical health	12% (15)
Employment/career	10% (12)
Marriage	25% (31)
Parenting	16% (20)
Social relationships	20% (25)
Life enjoyment	21% (26)
Other	4% (5)
<i>Pre-disaster psychiatric disorders (baseline^a data): % (n)</i>	53% (66)
PTSD	6% (8)
MDD	7% (9)
Alcohol use disorder	47% (56)
<i>Post-disaster psychiatric disorders (baseline^a and follow-up^b data)</i>	58% (72)
Bombing-related PTSD	24% (30)
MDD	35% (43)
Alcohol use disorder	28% (33)

^aPre-disaster and post-disaster disorders assessed at baseline include PTSD, major depression, panic disorder, generalized anxiety disorder, alcohol use disorder, and drug use disorder.

^bPost-disaster disorders assessed at follow up include PTSD, MDD, and alcohol use disorder. Note: PTSD = posttraumatic stress disorder; MDD=major depressive disorder.

(n = 18) described themselves as recovered at follow up, and 28% (n = 24) of those reporting recovery at baseline indicated that they were not recovered at follow up.

1 worker acknowledged, ‘I started drinking a lot then, and I haven’t quit. Every now and again I burst into tears for no apparent reason.’ Another reported, ‘I felt like life was just not worth living, it was hopeless; you kind of just want to withdraw and walk away from everything.’ 1 worker stated, ‘I am still recovering from it. I still have flashbacks.’ Some others described numb responses: ‘I went home the next day and just felt numb.’ Several workers mentioned that they avoided going downtown near the site of the bombing, and avoiding people and enjoyable activities: ‘I didn’t even like going fishing anymore.’ 1 worker explained, ‘Basically, we don’t want to hear about it. We don’t want to think about it. We don’t want to talk about it.’ Hyperarousal responses included descriptions of jumpiness and being easily startled, sleep difficulties, problems concentrating, irritability, and anger, e.g., ‘For a few weeks, if I’d hear a loud noise, it would bother me, but then that passed shortly.’ ‘I wouldn’t sleep at night; I’d wake up at 3:00 in the morning.’

At follow up, 43% of the firefighters reported substantial long-term personal problems arising from the bombing. 30% reported

Table 3. Comparison of subjectively reported psychosocial problems in disaster workers with and without post-disaster psychiatric disorders, using combined baseline and follow-up diagnostic data

Subjective long-term problem Post-disaster psychiatric disorder	Present % (n)	Absent % (n)	Significance^a
<i>MH problems</i>			
Disaster-related PTSD	54% (20)	11% (10)	$\chi^2 = 25.64, P < \mathbf{0.001}$
Post-disaster MDD	62% (23)	23% (20)	$\chi^2 = 17.59, P < \mathbf{0.001}$
Any post-disaster disorder	86% (32)	46% (40)	$\chi^2 = 17.50, P < \mathbf{0.001}$
Unremitted disaster-related PTSD or MDD	62% (18)	29% (9)	$\chi^2 = 5.70, P = 0.017$
<i>Physical health problems</i>			
Disaster-related PTSD	47% (75)	21% (23)	Fisher's exact $P = 0.049$
Post-disaster MDD	73% (11)	29% (32)	$\chi^2 = 11.26, P < \mathbf{0.001}$
Any post-disaster disorder	87% (13)	54% (59)	$\chi^2 = 5.73, P = 0.017$
Unremitted disaster-related PTSD or MDD	45% (5)	48% (20)	$\chi^2 = 0.02, P = 0.898$
<i>Employment problems</i>			
Disaster-related PTSD	48% (15)	16% (15)	$\chi^2 = 13.19, P < \mathbf{0.001}$
Post-disaster MDD	68% (21)	24% (22)	$\chi^2 = 19.95, P < \mathbf{0.001}$
Any post-disaster disorder	100% (12)	54% (60)	$\chi^2 = 9.60, P = \mathbf{0.0002}$
Unremitted disaster-related PTSD or MDD	45% (5)	48% (20)	$\chi^2 = 0.02, P = 0.898$
<i>Marital problems</i>			
Disaster-related PTSD	48% (15)	16% (15)	$\chi^2 = 13.19, P < \mathbf{0.001}$
Post-disaster MDD	68% (21)	24% (22)	$\chi^2 = 19.95, P < \mathbf{0.001}$
Any post-disaster disorder	90% (28)	47% (44)	$\chi^2 = 17.66, P < \mathbf{0.001}$
Unremitted disaster-related PTSD or MDD	54% (13)	41% (12)	$\chi^2 = 0.86, P = 0.353$
<i>Parenting problems</i>			
Disaster-related PTSD	50% (10)	19% (20)	Fisher's exact $P = \mathbf{0.008}$
Post-disaster MDD	60% (12)	30% (31)	$\chi^2 = 6.75, P = \mathbf{0.009}$
Any post-disaster disorder	85% (17)	53% (55)	$\chi^2 = 7.11, P = \mathbf{0.008}$
Unremitted disaster-related PTSD or MDD	71% (10)	38% (15)	$\chi^2 = 4.49, P = 0.034$
<i>Social problems</i>			
Disaster-related PTSD	60% (15)	15% (15)	$\chi^2 = 21.89, P < \mathbf{0.001}$
Post-disaster MDD	68% (17)	26% (26)	$\chi^2 = 15.35, P < \mathbf{0.001}$
Any post-disaster disorder	92% (23)	49% (49)	$\chi^2 = 14.81, P < \mathbf{P.001}$
Unremitted disaster-related PTSD or MDD	62% (13)	38% (12)	$\chi^2 = 3.03, P = 0.082$
<i>Problems enjoying life</i>			
Disaster-related PTSD	62% (16)	14% (14)	$\chi^2 = 25.02, P < \mathbf{0.001}$
Post-disaster MDD	69% (18)	26% (25)	$\chi^2 = 17.34, P < \mathbf{0.001}$
Any post-disaster disorder	88% (23)	50% (49)	$\chi^2 = 12.48, P < \mathbf{0.001}$
Unremitted disaster-related PTSD or MDD	55% (12)	42% (13)	$\chi^2 = 0.82, P = 0.365$
<i>No long-term problems</i>			
Disaster-related PTSD	7% (5)	47% (25)	$\chi^2 = 26.65, P < \mathbf{0.001}$
Post-disaster MDD	18% (13)	57% (30)	$\chi^2 = 19.65, P < \mathbf{0.001}$
Any post-disaster disorder	38% (27)	85% (45)	$\chi^2 = 28.39, P < \mathbf{0.001}$
Remitted disaster-related PTSD or MDD	20% (3)	58% (22)	$\chi^2 = 6.20, P = 0.013$

^adf = 1 for all comparisons in this table. PTSD = posttraumatic stress disorder; MDD = major depressive disorder.

Note: because there are 4 comparisons for each problem domain variable, a Bonferroni correction for multiple comparisons yields a significant P value of < 0.013 ($< 0.05/4$), to be considered in interpreting significant findings. Given this correction, significant P values are noted by bolded text.

Note: any post-disaster disorder includes PTSD, MDD, panic disorder, generalized anxiety disorder, alcohol use disorder, and drug use disorder.

problems specifically in MH and 25% in marital domains (see Table 2), and 20% of the sample reported social relationship and life enjoyment problems. Table 2 also describes psychiatric disorders in the rescue and recovery workers. 53% of the firefighter sample had a pre-existing psychiatric disorder at some time in their lives before the bombing (based on baseline data). After the bombing, based on merged baseline and follow-up data, 58% were diagnosed with a post-disaster psychiatric disorder. 24% were

diagnosed with bombing-related PTSD, 35% with post-disaster MDD, and 28% with post-disaster alcohol use disorder. At follow up, 13% ($n = 16$) experienced bombing-related PTSD in the last 12 months, representing a recovery rate of nearly 50% of all bombing-related PTSD diagnosed at baseline or follow up. In the last 12 months, 13% ($n = 16$) were still experiencing MDD. These represented a recovery rate of 63% of those with any post-disaster MDD diagnosed at baseline or thereafter. Other factors such as

demographic variables, injury in the bombing, and presence of a pre-disaster psychiatric disorder did not predict non-remission from bombing-related PTSD or post-disaster MDD in the last year at follow up. At follow up, 11% ($n = 14$) of workers received a diagnosis of PTSD (not shown in table) in addition to the 13% ($n = 16$) who were diagnosed with PTSD at baseline. At follow up, 27% ($n = 32$) of the workers were diagnosed with incident MDD (not shown in table) in addition to the 4% ($n = 11$) who had been diagnosed with incident MDD at baseline. Although the vast majority (92%) of the firefighters had received post-disaster MH interventions, only 16% received formal treatment, including 50% of those with PTSD.⁹

Table 3 shows associations of subjective reports of specific long-term post-disaster personal problems in survivors related to psychiatric disorders. It notes that almost all these problems were strongly associated with post-disaster psychiatric disorders. Most of the workers acknowledging these problems had post-disaster psychiatric disorders which were significantly associated, although minimally, with physical health problems. In general, 50%, or less, of those without these problems had no psychiatric disorders. Long-term subjective personal problems were not associated with remission of PTSD or MDD. No incident disorders were associated with post-disaster personal problems and therefore, none were presented in Table 3.

Discussion

This study of disaster response and recovery workers first examined within 3 years of the Oklahoma City bombing, and again nearly 25 years later, using structured diagnostic interviews, found that the majority met criteria for both pre-disaster, and post-disaster psychiatric disorders. Their patterns of MH problems differed from those of the direct bomb blast survivors studied by the same research team both in the first months after the disaster and long term. While the main psychiatric disorder among directly-exposed survivors was PTSD both initially and later, the predominant post-disaster disorder among the first responders was alcohol use disorder (almost all pre-existing, as previously described),³ at baseline and MDD in combined baseline and follow-up data. This finding did not change in the follow-up study.

The post-disaster prevalence of bombing-related PTSD in first responders nearly doubled (from 13% to 24%) over the years. Even though PTSD (13%) was more prevalent than MDD (8%) at baseline among the firefighters, the rate of accumulation of new cases of MDD over time more than quadrupled (35%), surpassing the post-disaster prevalence of disaster-related PTSD by follow up. This temporal pattern is quite different from that of the directly-exposed survivors, with PTSD being more prevalent initially, then increasing from 34% to 37%, and MDD increasing from 23% to 36% over the years.¹² The increases in MDD in both first responders and directly-exposed survivors may well represent, at least in part, the accumulation of endemic population disorders over time. The larger increases in both PTSD and MDD in the rescue workers, as compared to the survivors, could represent continuing hardships of professional and cumulative work stress in the firefighters. In the firefighters, most of the post-disaster MDD represented incident cases after the bombing, increasing from 4% to 27%, also consistent with work stress. The finding that feelings of upset about the bombing increased across the years also supports these findings.

50% or more of bombing-related PTSD and post-disaster MDD in the firefighters had not remitted at follow up. Similar to many other studies previously reviewed, few important predictors of

remission were found,^{13,14} especially in broader disaster-affected populations. This finding is also consistent with continuing work-related stress and hardship. It is also possible that the long-term medical problems among these workers contributed to these outcomes, and because marriage was the most affected domain, this may have been the most highly affected psychosocial consequence of their experience. Even remission from post-disaster psychiatric disorders did not appear to resolve the long-term personal problems.

Methodological strengths of this study most prominently include the use of structured diagnostic interviews in both the early and later assessments. Another major strength is the inclusion of the length of the prospective post-disaster follow up and the relatively low rate of sample attrition over time without biases identified in sex, age, race/ ethnicity, and education, as well as marital status, injury in the bombing, emotional responses to the disaster (upset, harm, recovery), or baseline pre-disaster and post-disaster psychiatric disorders. The main implications of the findings of this study for practice and policy are that psychiatric care needs of rescue and recovery workers after a disaster may increase substantially over time, whether as a consequence of the disaster itself or representing endemic difficulties arising from cumulative stress of this type of work. Either way, care is needed for these important professional workers.

Limitations

Limitations of this study include the volunteer nature of the baseline sample, which may have introduced baseline sample biases, without additional attrition biases identified over the follow up. Additionally, only bombing-related PTSD and MDD were fully assessed at follow up, along with a general assessment of alcohol problems. Furthermore, the findings from this study might not be representative of other rescue and response worker populations elsewhere and in other disasters. Additional long-term studies are needed to replicate the findings of this study in other rescue and recovery worker samples from other disaster. Studies are needed, using full diagnostic assessments including the full array of psychiatric disorders in the long term. Other studies are needed of non-disaster exposed samples of workers to determine if they too have increases in MDD that represent the natural course of this disorder over time in this population, or if the increase represented long-term vulnerability created by exceptional disaster experience. Experimental studies are needed to assess effects of early MH interventions and formal treatment both in the short term and their effects over the long term. As this study did not randomize MH interventions and formal treatment, it cannot assess the effects of these procedures on this population, although other studies have examined the effects in naturalistic, non-experimental data.^{9,15}

Conclusions

This study of disaster response and recovery workers first examined within 3 years of the Oklahoma City bombing and again nearly 25 years later, using structured diagnostic interviews, found that the majority met criteria for both pre-disaster and post-disaster psychiatric disorders. Although initially, the rescue and recovery workers had a lower prevalence of post-disaster PTSD and MDD than similar investigation of survivors with higher rates of PTSD than MDD, the prevalence of PTSD increased little, but the prevalence of MDD increased 4-fold over time. Fewer than

50% of the PTSD and MDD cases had remitted, indicating reason for continuing surveillance and availability of treatment for decades after disaster. Even though the high rates of alcohol use disorders were largely pre-existing, they also represent opportunities for identification and treatment of these problems in firefighters, regardless of disaster-related occurrence.

Author contributions. CS North: PI of the study, obtained funding, designed the study, and also gathered data, analyzed the data, and wrote the manuscript; Katy McDonald: assisted with revision of research assessments, assisted with tracking and scheduling of study participants, conducted research interviews, and also created data entry software, entered data, assisted with SAS data scoring for the Diagnostic Interview Schedule, and assisted with writing and editing of this manuscript

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