Mental Healthcare Needs in World Trade Center Responders: Results from a Large, Population-Based Health Monitoring Cohort

Olivia Diab[1] · Jonathan DePierro[1] · Leo Cancelmo[1] · Jamie Schaffer[1] · Clyde Schechter[2] · Christopher R. Dasaro[3] · Andrew Todd[3] · Michael Crane[1] · Iris Udasin[4] · Denise Harrison[5] · Jacqueline Moline[6] · Benjamin Luft[7] · Steven M. Southwick[8,9] · Adriana Feder[1] · Robert H. Pietrzak[8,9]

Abstract

Nearly two decades after the 9/11 attacks on the World Trade Center (WTC), the prevalence of mental disorders remains elevated among traditional (e.g., police) and non-traditional (e.g., construction workers) responders who were involved in the WTC rescue, recovery, and clean-up efforts. To date, however, scarce research has examined factors associated with perceived need for mental health care, which is critical to promoting engagement in mental health treatment in this population. Data were analyzed from 16,170 WTC responders, including 8881 police responders and 7289 non-traditional responders, who completed their first annual health monitoring visit with the WTC Health Program an average of 6.5 years after September 11, 2001. Predisposing, enabling, and need-based factors associated with perceived need for mental health care were examined using multivariable logistic regression analyses. Nearly half (48.7%) of non-traditional responders and a fifth (20.6%) of police responders reported a need for mental health care. The most common perceived needs were for psychotropic medication, individual psychotherapy, and stress management counseling. Predisposing (e.g., female gender) and need-based factors (e.g., WTC-related posttraumatic stress disorder) predicted perceived need for mental health care in both groups. Among non-traditional responders, Hispanic ethnicity and current suicidal ideation were additionally associated with this outcome. Non-traditional WTC responders are substantially more likely than police WTC responders to perceive a need for mental health treatment. Characterization of factors associated with perceived need for treatment can help inform population-based outreach and monitoring efforts designed to promote engagement in mental health treatment in WTC responders.

Keywords Mental health service needs · World Trade Center responders · Perceived needs · Community services

Olivia Diab and Jonathan DePierro have shared first authorship.

✉ Jonathan DePierro
jonathan.depierro@mssm.edu

[1] Department of Psychiatry, Icahn School of Medicine at Mount Sinai, One Gustave L. Levy Place, Box 1230, New York, NY 10029, USA

[2] Department of Family and Social Medicine, Albert Einstein College of Medicine of Yeshiva University, Bronx, NY, USA

[3] Department of Environmental Medicine and Public Health, Icahn School of Medicine at Mount Sinai, New York, NY, USA

[4] EOHSI Clinical Center, Rutgers University, Piscataway, NJ, USA

[5] Department of Medicine, NYU Langone Medical Center, New York, NY, USA

[6] Department of Occupational Medicine, Epidemiology and Prevention, Northwell Health, New York, NY, USA

[7] Stony Brook WTC Wellness Program, Stony Brook University, Stony Book, NY, USA

[8] U.S. Department of Veterans Affairs National Center for Posttraumatic Stress Disorder, VA Connecticut Healthcare System, West Haven, CT, USA

[9] Department of Psychiatry, Yale University School of Medicine, New Haven, CT, USA

Background

Following the September 11, 2001 World Trade Center (WTC) attacks, tens of thousands of rescue, recovery and clean-up workers have received evaluation and treatment services through the federally funded World Trade Center Health Program (WTC-HP). This cohort of responders consists of "traditional responders" with training in disaster response (e.g., police officers, firefighters, and emergency medical services workers), and "non-traditional responders" (e.g., transit employees, volunteers, telecommunications workers, construction and asbestos workers). Many of these workers were exposed to hazardous working conditions, toxic agents and potentially traumatic psychological stressors while searching for survivors and cleaning up debris. In addition to medical illnesses, such as cancer and upper and lower respiratory ailments (Dasaro et al. 2015; Gargano et al. 2018; Singh et al. 2018; Solan et al. 2013; Wisnivesky et al. 2011), upwards of 20% of the WTC responders developed posttraumatic stress disorder (PTSD) and other mental health conditions related to their work on the rescue, recovery and clean-up efforts (Bromet et al. 2018; Feder et al. 2016; Pietrzak et al. 2014). Responders with WTC-related posttraumatic stress disorder (PTSD) and related problems are able to receive no-cost, mental health treatment through the WTC-HP, a federally funded health monitoring and treatment program. The present study aims to address gaps in the literature by examining perceived need for mental health services within a large sample of WTC responders.

While there have been numerous cross-sectional and longitudinal studies of mental health conditions within the WTC responder cohort (Bromet et al. 2016, 2018; Dasaro et al. 2015; Feder et al. 2016; Perrin et al. 2007; Pietrzak et al. 2012, 2014), little research has examined either perceived needs for mental health or factors that could contribute to actual help in seeking and utilizing program services, including mental health screening and treatment. Research by the New York City WTC Health Registry, obtained from large-scale, self-reported surveys of WTC responders and survivors (i.e., those living and working in Lower Manhattan at the time of the attacks), indicates that approximately one-third of those surveyed reported unmet mental health care needs (Ghuman et al. 2014). Another study from the same group found individuals with greater mental health symptoms were more likely to endorse unmet mental health needs in the past year, even though many also endorsed making use of mental health services in that time (Brackbill et al. 2013).

Several factors may impact perceived service need for mental health care. With respect to symptom endorsement, there are significant differences in symptom presentation between traditional and non-traditional responder groups, in general. Non-traditional responders are more likely to present with more WTC-related symptomatology, including posttraumatic stress disorder symptoms (Bromet et al. 2016; Perrin et al. 2007). This finding may be attributable to the fact that, while many of the traditional responders had undergone some level of training in disaster response, most non-traditional responders received little or no prior training (Herbert et al. 2006). Furthermore, prior research has shown that certain populations, such as female responders, Hispanic responders and responders with lower levels of education, are significantly more likely to develop psychiatric problems (Pietrzak et al. 2014). To date, however, whether this difference in symptomatology might translate to endorsement of a mental health care need has not been fully investigated.

In the present study, we draw upon the Andersen Model of Health Service Use (AMHSU; (Andersen 1995) as a framework for understanding factors that contribute to self-rated mental health service needs in this large cohort of police and non-traditional WTC responders. The Andersen model delineates predisposing, enabling and need-based factors that contribute to decisions to seek help. Predisposing factors are typically considered to be demographic variables, including age, gender, marital status and race/ethnicity. Enabling factors include income, social support and level of education. Need-based factors include endorsed present symptom burden, past psychiatric history, life stressors and number of medical comorbidities.

We had two aims in this study. First, we sought to understand the types of mental health services that WTC responders endorse needing and if endorsement differed by responder subgroup. We hypothesized that, relative to police responders, non-traditional responders would be more likely to endorse needing any mental health services and would be more likely to endorse needing individual psychotherapy and psychotropic medication. Second, we sought to examine factors associated with perceived mental health service need and how these may differ between responder subgroups. Based on the AMHSU, we hypothesized that, for both police and non-traditional responders, several predisposing (e.g., age and gender), enabling (e.g., income and education) and need-based factors (e.g., WTC-related PTSD and pre-9/11 psychiatric history) would be associated with increased likelihood of endorsement of need for mental health services.

Methods

The present study comprised a secondary analysis arising from a previously published investigation of mental health trajectories in WTC responders (Pietrzak et al. 2014). A total of 16,170 responders (8881 police and 7289 non-traditional)

had complete mental health care needs data from their first WTC-HP health monitoring visit and were included in analyses; multiple imputation using chained equations was used to impute missing data (< 5% across study variables) prior to conducting the analyses described below. We were limited to the examination of police responders in the "traditional" responder group due to issues of data availability for other subgroups (for example, New York City-based fire responders have a dedicated health program with different assessment procedures). This project was approved by the Mount Sinai Program for Protection of Human Subjects, and all participants provided consent for their health information to be used for research.

Assessments

All measures were obtained at participants' first health monitoring visit.

PTSD Checklist-Specific Stressor Version (PCL-S)

The PCL-S (Blanchard et al. 1996; Weathers et al. 1993) is a 17-item, self-report instrument based on DSM-IV criteria for PTSD that was used to assess WTC-related PTSD symptoms; a PCL-S score ≥ 44 was used to identify probable PTSD. Cronbach's alpha on PCL-S items was 0.95 and 0.96 for police and non-traditional WTC responders, respectively.

The Patient Health Questionnaire-9 (PHQ-9)

The PHQ-9 (Kroenke and Spitzer 2002; Kroenke et al. 2001) is a nine-item screening instrument for depression. A score of 10 or higher indicates a positive screen for depression. Cronbach's alpha on PHQ-9 items was 0.89 and 0.93 for police and non-traditional WTC responders, respectively.

Suicidal Ideation

Item 9 from the PHQ-9 (Kroenke and Spitzer 2002; Kroenke et al. 2001) was used to assess current suicidal ideation ("Thoughts that you would be better off dead, or of hurting yourself"). Scores of 1 or higher, indicative of "several days" or greater frequency of suicidal ideation, were operationalized as a positive screen for suicidal ideation.

Alcohol Use Problems

The CAGE Questionnaire (King 1986) is a four-item instrument used to identify individuals with a possible alcohol problem; a score of 2 or higher indicates a possible alcohol problem. Cronbach's alpha on CAGE items was 0.67 and 0.78 for police and non-traditional WTC responders, respectively.

The Sheehan Disability Scale (SDS)

The SDS (Sheehan 1983; Sheehan et al. 1996) is a three-item, self-report instrument used to assess degree of functional impairment in work and in social and family life. The responses to these items were averaged to yield a single composite: Cronbach's alpha on SDS items was 0.92 and 0.87 for police and non-traditional WTC responders, respectively.

Social Support

Sources of family and work social support were assessed by asking respondents to endorse important sources of support while working on the WTC effort. Sources of support were summed to represent total number of family supports (sources assessed were spouse/partner, children and parent(s); range 0–5; analyzed as a continuous variable) and total number of work-related supports while working on the WTC effort (sources assessed included supervisor and co-workers; range 0–2; coded as '0' versus '1 or 2' because of restricted range).

Prior Psychiatric History

Psychiatric history prior to 9/11 was assessed by asking respondents if they had ever been diagnosed by a healthcare professional with depression, anxiety disorder or PTSD prior to 9/11. This variable was coded as '0' = no diagnosis or '1' = one or more of these diagnoses.

Life Stressors

Stressful life events before and after 9/11 were assessed using questions from the Disaster Supplement of the Diagnostic Interview Schedule (Robins and Smith 1983). Fifteen negative life events were assessed (e.g., divorce/separation, personal illness, family illness or death), for both the year before 9/11 and the years since (score range 0–15 events before and since 9/11).

World Trade Center Exposure Severity

WTC-related exposures were assessed via clinician-administered interview and self-report questionnaires. Exposures assessed included (1) early arrival (i.e., beginning work at the WTC worksite between 11 and 13 September 2001); (2) being caught in the dust cloud arising from the collapse of the towers; (3) working primarily at or adjacent to the collapsed buildings (known as the 'in the pit' and 'on the pile') during September 2001; (4) working more than the median number of hours on the WTC site; (5) any exposure to human remains between September 11, 2001 and June 30,

2002); (6) involvement in search-and-rescue efforts between September 11, 2001 and October 31, 2001; (7) sleeping on site; (8) traumatic death of a colleague, family member or friend on 9/11; (9) being treated for an injury or illness while working on the WTC recovery effort; and (10) knowing someone who suffered an injury on 9/11. We used the total number (range 0–10) of WTC exposures for analysis.

Medical Conditions

Somatic diagnoses, assessed via comprehensive medical examinations, were counted. WTC-related medical illness burden was the number of the most common WTC-related medical conditions (e.g., asthma, gastroesophageal reflux disease (GERD), and sinusitis) that were diagnosed no later than 3 months after participants' first health monitoring visit.

Perceived Mental Health Service Needs

Perceived service needs were assessed using a self-report measure in which participants were asked, "In the next 12 months, which services do you think you might need? (Check ALL answers that apply)." See Table 1 for item content and rates of endorsement.

Data Analysis

Data analyses proceeded in two steps. First, we computed descriptive statistics and Chi square analyses to compare frequencies of endorsement of any perceived need for mental health care, as well as specific types of mental health care needs, in police and non-traditional WTC responders. Second, we conducted multivariable binary logistic regression analyses—one in police responders and another in non-traditional responders—to identify predisposing, enabling and need-based correlates of perceived mental health care needs in both these groups. To reduce the likelihood of Type I error in comparisons of specific mental health care needs by WTC responder type, alpha was set to 0.00625 (0.05/8 specific types of mental health care needs = 0.00625) for these analyses.

Results

WTC responders in the sample completed their first annual health monitoring visit with the WTC Health Program (WTC-HP) an average of 6.5 years after 9/11 (SD 2.6, range 1–12 years; the number of years since September 11, 2001 until the first monitoring visit was greater in police vs. non-traditional WTC responders: mean = 6.9 years, SD 2.6, range 2–12 vs. mean = 6.2 years, SD 2.6, range 1–12; $F = 296.71$,

$p < 0.001$). The sample was predominantly male, identified as non-Hispanic White, earned a middle income or below, and married (Table 1 shows demographic information).

Table 1 shows descriptive statistics on perceived mental health service need by WTC responder type. Non-traditional WTC responders were more than twice as likely as police WTC responders to endorse any mental health service need, as well as each of the individual mental health service needs assessed. Across groups, the most commonly endorsed mental health service needs were psychotropic medication, one-to-one counseling and stress management counseling.

In police responders, factors significantly and independently associated with any perceived mental health service need were older age, female gender, diagnosis of depression/anxiety/PTSD before 9/11, positive screens for WTC-related PTSD, depression, and alcohol use problems, count of somatic diagnoses, and higher SDS score and more life stressors post 9/11 (see Table 1).

In non-traditional responders, factors that were significantly associated with perceived mental health service need were female gender, Hispanic ethnicity, diagnosis of depression/anxiety/PTSD before 9/11, positive screens for WTC-related PTSD, depression, SI, and alcohol use problems, and higher SDS score and more life stressors post 9/11 (see Table 1).

Discussion

This study examined the nature and correlates of perceived mental health care needs in a large cohort of more than 16,000 WTC rescue, recovery and clean-up workers. Results indicated that both police and non-traditional WTC responders perceived the need for various mental health care services. Police responders were significantly less likely than non-traditional responders to endorse any perceived mental health service need, with the most commonly endorsed needs being psychotropic medication, individual counseling and stress management services. This difference in endorsement of perceived need may reflect the lower prevalence of psychiatric problems in our police responders, which in turn could be attributable to their choice of and selection for an occupation that includes routine exposure to traumatic stressors, and to their having received training in disaster preparedness and response (Alexander and Wells 1991). However, this difference may also be indicative of a culture that can stigmatize endorsement of symptoms of mental illness and help-seeking in order to maintain employment (Haugen et al. 2017), leading to under-reporting of distress and service needs.

With respect to predictors of perceived mental health service need, there were overall similarities among the predictive factors between police and non-traditional WTC

Table 1 Prevalence and predictors of perceived mental health service needs in police and non-traditional WTC responders

Prevalence of perceived mental health service needs

Perceived needs	Police responders (n = 8881) n (%)	Non-traditional responders (n = 7289) n (%)	Chi square	Cramer's V
Any service need	1826 (20.6)	3555 (48.7)	1432.87***	0.30
Medication for emotional problems, nerves or sleep	638 (7.2)	1800 (24.7)	957.77***	0.24
One-to-one counseling	757 (8.5)	1781 (24.4)	765.00***	0.22
Stress management counseling	770 (8.7)	1546 (21.2)	512.35***	0.18
Marriage and family counseling	471 (5.3)	679 (9.3)	97.36***	0.08
Religious/spiritual counseling	235 (2.6)	453 (6.2)	125.00***	0.09
Peer support groups	147 (1.7)	430 (5.9)	209.37***	0.11
Family support counseling	179 (2.0)	412 (5.6)	150.21***	0.10
Alcohol abuse counseling/treatment	65 (0.7)	261 (3.6)	164.35***	0.11

Multivariable logistic regression predicting endorsement of any perceived mental health service need

	Police responders			Non-traditional responders		
	N (%)	Mean (SD)	OR (95% CI)	N (%)	Mean (SD)	OR (95% CI)
Predisposing factors						
Age	–	42.6 (7.0)	**1.02 (1.01–1.03)****	–	46.5 (10.1)	1.00 (1.00–1.01)
Gender						
Male (reference)	7472 (84.1)	–	–	6279 (86.1)	–	–
Female	1409 (15.9)	–	**1.37 (1.16–1.61)*****	1010 (13.9)	–	**1.49 (1.26–1.77)*****
Race/ethnicity						
White, non-Hispanic (reference)	4905 (55.2)	–	–	4063 (55.7)	–	–
Black, non-Hispanic	1177 (13.3)	–	1.18 (0.98–1.42)	795 (10.9)	–	1.19 (0.97–1.42)
Hispanic	2272 (25.6)	–	1.02 (0.88–1.19)	2056 (28.2)	–	**1.60 (1.39–1.84)*****
Other	527 (5.9)	–	0.92 (0.70–1.21)	375 (5.1)	–	0.98 (0.76–1.27)
Enabling factors						
Income						
≤ US $80 k/year (reference)	5551 (62.5)	–	–	5668 (77.8)	–	–
> US $80 k/year	3330 (37.5)	–	0.97 (0.85–1.10)	1621 (22.2)	–	0.87 (0.75–1.00)
Education						
High school or less (reference)	96 (1.1)	–	–	969 (13.3)	–	–
More than high school	8785 (98.9)	–	0.73 (0.41–1.29)	6320 (86.7)	–	1.15 (0.97–1.36)
Marital status						
Never married (reference)	1108 (12.5)	–	–	1035 (14.2)	–	–
Married or partnered	5567 (62.7)	–	1.01 (0.83–1.22)	4295 (58.9)	–	1.03 (0.87–1.22)
Widowed, separated or divorced	2206 (24.8)	–	0.92 (0.75–1.14)	1959 (26.9)	–	1.04 (0.86–1.27)
Need-based factors						
Diagnosis of depression, anxiety and/or PTSD before 9/11/2001	809 (9.1)	–	**2.51 (2.08–3.03)*****	1356 (18.6)	–	**2.17 (1.84–2.54)*****
Number of life stressors in year before 9/11	–	1.2 (1.6)	0.97 (0.93–1.01)	–	1.7 (2.4)	1.02 (0.99–1.05)
Number of WTC exposures	–	4.7 (1.9)	1.01 (0.97–1.04)	–	3.3 (1.9)	1.01 (0.98–1.05)
Number of sources of family support while working at WTC site	–	2.2 (1.4)	0.97 (0.93–1.02)	–	1.5 (1.4)	1.00 (0.96–1.05)
Number of sources of work support while working at WTC site	–	0.7 (0.8)	1.04 (0.96–1.14)	–	0.5 (0.7)	1.01 (0.92–1.10)
Positive PTSD screen (PCL-S score ≥ 44)	812 (9.1)	–	**2.91 (2.37–3.59)*****	2456 (33.7)	–	**2.50 (2.14–2.91)*****
Positive depression screen (PHQ-9 ≥ 10)	667 (7.5)	–	**1.61 (1.27–2.04)*****	2078 (28.5)	–	**1.62 (1.37–1.91)*****
Current suicidal ideation (PHQ-9 item 9 ≥ 1)	201 (2.8)		1.28 (0.83–1.98)	1067 (12.0)		**1.60 (1.28–1.99)*****

Table 1 (continued)

Multivariable logistic regression predicting endorsement of any perceived mental health service need

	Police responders			Non-traditional responders		
	N (%)	Mean (SD)	OR (95% CI)	N (%)	Mean (SD)	OR (95% CI)
Positive alcohol screen (CAGE ≥ 2)	448 (5.0)	–	**2.13 (1.67–2.70)*****	898 (12.3)	–	**2.23 (1.86–2.68)*****
Count of somatic diagnoses	–	0.7 (0.8)	**1.08 (1.01–1.16)***	–	0.6 (0.8)	1.06 (0.99–1.14)
SDS average score	–	1.0 (1.9)	**1.42 (1.37–1.48)*****	–	2.7 (2.8)	**1.28 (1.25–1.32)*****
Number of life stressors in year since 9/11	–	2.8 (2.3)	**1.17 (1.14–1.21)*****	–	4.0 (3.1)	**1.12 (1.09–1.14)*****

Nagelkerke R^2 in regression models for police and non-traditional responders = 0.36 and 0.45, respectively

Bolded ORs (95% CI) indicate a statistically significant association with any perceived service need: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

WTC World Trade Center, *OR* odds ratio, *95% CI* 95% confidence interval, *SD* standard deviation, *PTSD* posttraumatic stress disorder, *PCL-S* PTSD Checklist-Specific Stressor Version, *PHQ-9* Patient Health Questionnaire-9, *SDS* Sheehan Disability Scale

responders. Specifically, screening positive for depression and PTSD, pre-9/11 psychiatric history and greater functional impairment were associated with greater perceived mental health service need in both groups. Female responders, both police and non-traditional, were more likely than male responders to report any perceived need for mental health services. These findings are consistent with previous mental health work in WTC responders indicating that female gender, pre-9/11 psychiatric history, greater number of medical diagnoses and Hispanic ethnicity were associated with greater likelihood of severe PTSD (Pietrzak et al. 2014), which may, in turn, prompt greater perceived need for mental health services. Self-reported suicidal ideation (SI) predicted endorsement of a mental health service need in non-traditional responders only; however, it is important to note that only 2.8% of police responders (vs. 12% of non-traditional responders) endorsed threshold suicidal ideation on the depression measure. Lower rates of SI endorsement in police responders may be reflective of mental health stigma affecting reporting SI in this population, and is particularly concerning given the increased risk of completed suicide within law enforcement in general (Heyman et al. 2018). With respect to clinical practice, our findings highlight the importance of targeted, population-based outreach efforts addressing WTC and other disaster responders with the greatest need for mental health treatment.

There were significant between-group differences in terms of types of services endorsed. In the non-traditional WTC responders, the most endorsed mental health service need was psychotropic medication (24.7%). Within the police WTC responders, the most common endorsed need was stress management counseling (8.7%). Research has shown that, among other consequences, traditional responders such as police officers may expect discrimination at work if they were to disclose a mental illness, and may thus be more reluctant to endorse services that address "emotional problems" or involve psychotropic medication (Haugen et al. 2017). Traditional responders may be more inclined to

utilize individual (vs. group), confidential, peer counseling instead of more formal (and formally documented) treatment (Dowling et al. 2005). At the same time, differential endorsement of service needs between responder groups may be a consequence of lower symptom levels in the police responders, if their self-report scores accurately reflect their level of distress.

Our study has limitations. First, the data are cross-sectional, so the directional association between predisposing, enabling and need-based factors and the perceived need for mental health services cannot be ascertained. Second, the assessment was conducted an average of 6.5 years after 9/11 in WTC responders who completed a voluntary health monitoring visit; given the limited time range of that initial visit, it is not certain whether these results can be generalized to the broader population of WTC responders. Third, while our results provide insight into the nature and correlates of perceived mental healthcare needs in WTC responders, it is unclear whether these same correlates may also prospectively predict actual engagement, retention, and/or response to mental health treatment in this population. There is a significant gap in the literature regarding rates and predictors of actual mental health service utilization in clinical programs for WTC responders; this has been directly examined in only a few studies to date in the now 18 years since the events of 9/11/01 (Bellehsen et al. 2019; Jayasinghe et al. 2005, 2006).

The WTC general responder population is unique in that they are offered free mental health treatment through the WTC-HP for conditions related to their rescue, recovery and clean-up work. Clinicians and staff working to screen responders for these services should be particularly aware of overlapping subgroups that endorse the highest perceived need for treatment, including female, Hispanic and non-traditional responders. Differences between responder groups emerged with respect to the kinds of service needs that were endorsed, which may help inform patterns of service use. For example, police responders demonstrated a preference for stress management/one-to-one-counseling

over "medication for emotional problems, nerves or sleep," unlike non-traditional responders. It is thus important to be mindful of how mental health treatment options are presented to members of professions known to have increased stigma toward mental illness (Haugen et al. 2017), so that their preferences, target complaints, and barriers to care can be successfully addressed.

While the present study highlighted meaningful predictors of self-rated service needs in WTC responders, further research is needed to: (1) examine perceived needs and preferences for mental health care in this cohort using more detailed descriptions of possible services; (2) evaluate whether targeted, population-based outreach efforts may help engage WTC responders in mental health treatment; and (3) identify predisposing, enabling, and need-based factors associated with actual engagement in mental health services in this population. Preferences for more "novel" services that may address concrete barriers to care, such as delivery of care via telemental health platforms, which are widely utilized in veteran settings (Chen et al. 2019; Godleski et al. 2012), have not yet been evaluated in WTC responders. All of these areas for future investigation have the potential to ease the well-documented mental health burden of WTC responders, many of whom now also experience growing medical needs, such as increasing rates of cancers associated with WTC exposure (Singh et al. 2018), as well as cognitive impairment (Clouston et al. 2019).

Compliance with Ethical Standards

Conflict of interest Dr. Feder (co-inventor) and Mount Sinai have been named on a use patent application of ketamine for the treatment of posttraumatic stress disorder; patent is currently pending. Dr. Schechter has received consulting fees from Accolade, Inc., for analysis of claims data in evaluation of the effectiveness of their services and for technical support provided to in-house statistical staff. Dr. Pietrzak is a scientific consultant to CogState Ltd. Drs. DePierro, Crane, Harrison, Luft, Moline, and Southwick and Ms. Diab, Ms. Schaffer and Mr. Cancelmo report no competing interests.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee (Mount Sinai Program for the Protection of Human Subjects, HS#: 11-01635) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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