Psychiatric Outcomes in Responders Exposed to the 9/11 Disaster: What have we learned in 23 years?

October 27, 2024

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Disclosure: I have no conflicts of interest.

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Outline

- WTC psychological exposure and related psychiatric conditions
- Research on mental health outcomes associated with 9/11 exposure
- Screening and management of psychiatric conditions
- Challenges and lessons learned

WTC Mass Disaster Exposure

- Immediate risk to life, losses, horrific events, severe injuries, dust cloud
- Response efforts and exposure were prolonged
- Long hours and hazardous conditions
- Many had no PPE or disaster response training

Dual exposure to environmental and psychological hazards influenced nature of health consequences

Photos in public domain/creative commons

Calvert, et al. 2023 The World Trade Center Health Program: an introduction to best practices. Arch Environ Occup Health.

Disaster exposure and psychological responses

Range of reactions:

- Most 9/11 responders did not suffer lasting MH effects
- Psychological distress, physical stress symptoms are normal
- *Emotional resilience is most common response to trauma exposure*
- Trauma exposure is known risk factor for psychiatric illness
  - ~25% of cohort diagnosed with psychiatric condition
- Interplay of factors mediate mental health (MH) outcomes
  - Predisposing factors, event characteristics, post-9/11 adversities

Goldmann, E., & Galea, S. (2014). Mental health consequences of disasters. Annual review of public health, 35.
Smith, et al, (2021). Health Trends among 9/11 Responders from 2011–2021: A Review of World Trade Center Health Program Statistics.

Neurobiological impact of psychological trauma

-Danger activates a physiologic response mediated by HPA system

"fight/flight/freeze response"

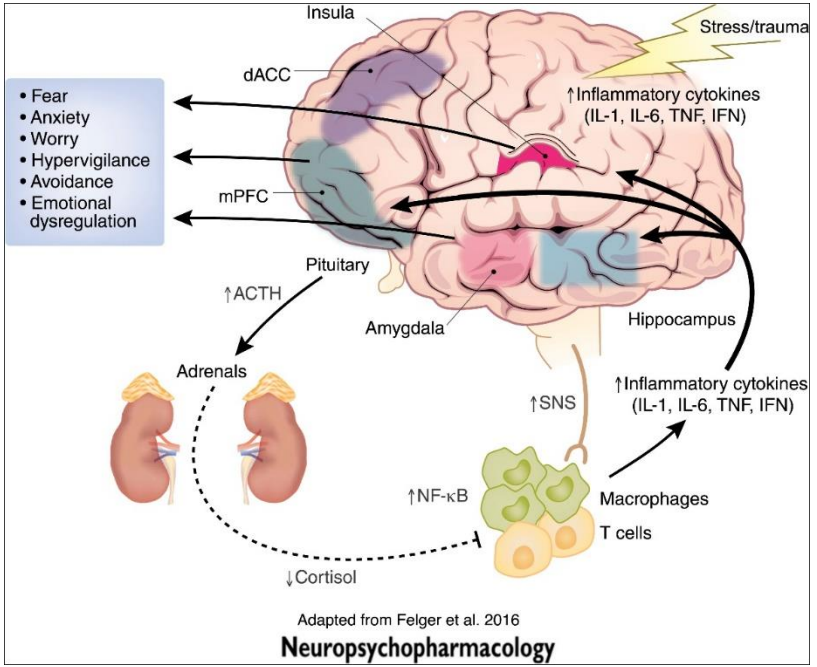
-Prolonged activation may lead to systemic dysregulation

→ Neuroendocrine

→ Immune/Inflammatory systems

→ Disrupts brain circuitry

-Risk for neuropsychiatric, autoimmune, CV, cognitive diseases



Neuropsychopharmacology Reviews (2017) **42**, 254 270

HPA= hypothalamic–pituitary–adrenal axis

WTC Related MH conditions

- Acute stress disorder
- PTSD
- Depressive disorders
- Anxiety disorders
- SUD
- Adjustment disorders

Member Certifications

3/31/24

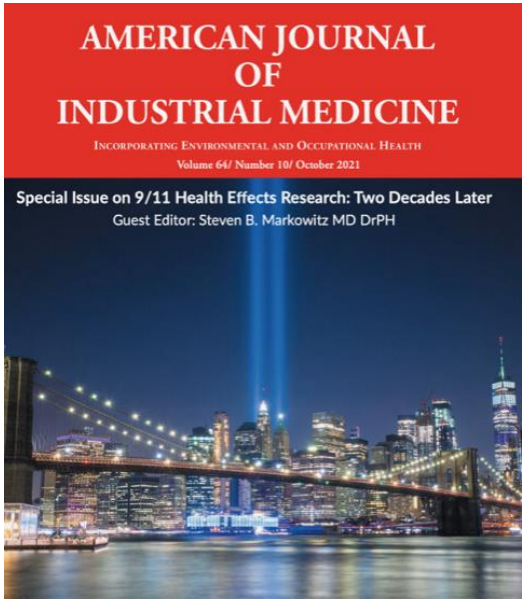
Category	Combined Cohort
Aerodigestive	57,785
Cancer	38,880
Mental Health	23,536
Musculoskeletal	647

Total Certified Members	**83,942**

* SUD= substance use disorders; Centers for Disease Control and Prevention https://www.cdc.gov/wtc/about.html Total Certified Members represent the specific number of members certified.

20 Years of Research on Mental Health Effects of 9/11 Exposure

Health Effects of 9/11: An Online Exhibition - WTC Health Program (cdc.gov)



9/11 Health Effects Research: Two Decades Later
American Journal of Industrial Medicine Vol 64 Oct 2021

Research on Mental Health Outcomes

- Predisposing and resilience factors
- Role of exposure severity and duration
- Prevalence and trajectory
- Effect of comorbid conditions
- Relationship between occupation and training and mental health outcomes
- Impact of psychosocial factors

Prevalence and Trajectory

RESEARCH Open Access

Persistent mental and physical health impact of exposure to the September 11, 2001 World Trade Center terrorist attacks

Hannah T. Jordan[1,2*], Sukhminder Osahan[1], Jiehui Li[1], Cheryl R. Stein[3], Stephen M. Friedman[1], Robert M. Brackbill[1], James E. Cone[1], Charon Gwynn[4], Ho Ki Mok[1] and Mark R. Farfel[1]

10-15 years after 9/11

- PTSD *9%-24%*
- Depression 18%
- Alcohol misuse 25%

- Trajectory of PTSD symptoms in responders heterogeneous
- Symptoms present anytime, endure for decades, resolve, worsen or resurface
- Presents an ongoing health burden

Jordan, et al., (2019); Santiago-Colón, et al., (2020); Chen, et al., (2020)

Medical and Psychiatric Comorbidity

Comorbidity is factor most strongly associated chronic 9/11 related illness and functional impairment

- 22% certified with WTC-related physical and psychiatric illness
- Co-existing MH condition closely tied to poor control of asthma
- PTSD is a risk factor for respiratory symptoms
- Psychiatric conditions highly comorbid with each other

Importance of integrated mental and physical health screening and treatment

Jordan, et al. Factors Associated with Poor Control of 9/11-Related Asthma 10-11 Years after the 2001 World Trade Center Terrorist Attacks J Asthma. 2015; Pietrzak, et al., 2014; Dowling & Lowe, 2023; Kotov, et al. 2015

Responder Occupation Associated with MH Outcomes

Heterogeneous cohort; impact of exposure on MH differs by responder type

Traditional Responders

- Firefighters
- Law enforcement, National Guard
- Medical

Non-Traditional Responders

- Restoration and clean-up workers
- Construction, utility, sanitation
- Volunteers, clergy

Shannon Stapleton Reuters

Joel Meyerowitz

Non-traditional Responders: workers who engaged in 9/11 response activities outside their scope of work have worse MH outcomes

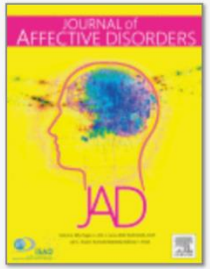
PTSD prevalence and trajectory differs across responder occupations

- 18% among non-traditional responders vs. 6% in police responders
- Police responders more likely to exhibit a resistant/resilient PTSD trajectory (8-year prospective study)

Disaster preparedness training may protect against psychiatric morbidity associated with response work.

Perrin, et al., 2007 Differences in PTSD prevalence and associated risk factors among World Trade Center disaster rescue and recovery workers; Pietrzak et al., Trajectories of PTSD risk and resilience in World Trade Center responders: An 8-year prospective cohort study.

Prevalence of suicidal ideation (SI) varied by responder type



Prevalence and correlates of suicidal ideation in World Trade Center responders: Results from a population-based health monitoring cohort

Journal of Affective Disorders

Volume 306, 1 June 2022, Pages 62-70

- Study examined prevalence of SI in >30,000 responders
  - 12.5% in non-traditional responders vs. 2.2% in police
- Suicide risk factors: SI, chronic psychiatric and medical conditions
- Suicide mortality in WTC cohort: inconsistent findings

SI in US adult population 4.8% Suicide Data and Statistics | Suicide Prevention | CDC Gibson, et al., 2022

Traditional Responders:
Risk factor for psychiatric morbidity is repeated trauma exposure

- Occupational hazard for first responders and healthcare workers
- Prior trauma increases risk of adverse effects upon repeated exposure
- WTC cohort: exacerbation of 9/11 symptoms following natural disasters, war, COVID-19

Lowe, et al. (2021) COVID-19 Pandemic and the Five Essential Elements in Mass Trauma Intervention: Perspectives from WTC Health Program Mental Health Clinicians. Psychiatry

Research on Psychosocial Factors: Post-9/11 socioeconomic losses

"We found that workers with chronic conditions were more likely to experience early retirement and job loss, and the likelihood increased considerably when the worker also had PTSD. "

- Financial stressors, loss of medical benefits
- Loss of worker identity and community cohesion
- Family conflict/loss of relationships
- Psychosocial interventions in the workplace

Yu, et al. 2016, Impact of 9/11-related chronic conditions and PTSD comorbidity on early retirement and job loss among World Trade Center disaster rescue and recovery workers. Am J Ind Med.

Social Support

Bidirectional relationship between MH outcomes and social support

WTC cohort

- Social integration associated with resilient PTSD trajectories
- One source of social support during recovery effort associated with fewer psychiatric symptoms
- Work environment potential source of support

Library of Congress, Washington D.C.

Feder, et al., 2016, Risk, coping and PTSD symptom trajectories in World Trade Center responders; Pijnenburg, et al., 2023 Perceived social support and longitudinal trajectories of depression and anxiety in World Trade Center responders

Cognitive Impairment (CI) and WTC Exposures

Washington Post 20-year Anniversary Edition, 9/11/2021

Clouston, et al., (2019) Clouston, et al., (2022) Cognitive impairment and World Trade Centre-related exposures. Nature reviews.

ELSEVIER
Check for updates
Alzheimer's & Dementia: Diagnosis, Assessment & Disease Monitoring 11 (2019) 628-636
Alzheimer's & Dementia

Diagnostic Assessment & Prognosis

Incidence of mild cognitive impairment in World Trade Center responders: Long-term consequences of re-experiencing the events on 9/11/2001

Sean A. P. Clouston[a,*], Erica D. Diminich[a], Roman Kotov[b], Robert H. Pietrzak[c,d], Marcus Richards[e], Avron Spiro III[f,g,h], Yael Deri[i], Melissa Carr[i], Xiaohua Yang[i], Sam Gandy[k,l], Mary Sano[l,m], Evelyn J. Bromet[b], Benjamin J. Luft[n]

-1800 cognitively intact responders (ave. age 53) assessed over 18 months

- 14.2% developed mild CI

-High prevalence of CI and cortical atrophy among responders with chronic PTSD and high environmental exposure

Best Practices for Screening and Management of Trauma-Related Psychiatric Disorders

- VA/DoD Clinical Practice Guideline for Management of Posttraumatic Stress Disorder and Acute Stress Disorder(2023)
- American Psychological Association CPG for the Treatment of Depression Across Three Age Cohorts (2019)
- VA/DoD CPG for the Management of Major Depressive Disorder (2022)

Posttraumatic Stress Disorder (PTSD)

- Most diagnosed MH condition in the 9/11 cohort; highly comorbid
- Associated with
  - Chronic physical symptoms
  - Cognitive impairment
  - Functional, occupational, social impairment
  - Interpersonal problems
  - Sleep disturbance (>90% in PTSD)

Dowling & Lowe, 2023 Substance use and related disorders among persons exposed to the 9/11 terrorist attacks, Arch of Environ. & Occupational Health

PTSD: Diagnostic Features

- Exposure to actual or threatened death, serious injury or sexual violence
- Intrusive thoughts or images of trauma
- Persistent avoidance of trauma triggers
- Negative mood and cognitions (survivor guilt)
- Hyperarousal, hypervigilance, heightened reactivity

Getty Images

Diagnostic and Statistical Manual of Mental Disorders 5th ed., 2013

Primary Care PTSD Screen

In the past month, have you… (YES/NO)

- Had nightmares about the event(s) or thought about the event(s) when you did not want to?
- Tried hard not to think about the event(s) or went out of your way to avoid situations that reminded you of the event(s)?
- Been constantly on guard, watchful, or easily startled?
- Felt numb or detached from people, activities, or your surroundings?
- Felt guilty or unable to stop blaming yourself or others for the event(s) or any problems the event(s) may have caused?

Prins, et al., (2015) *The Primary Care PTSD Screen for DSM-* 5

PTSD is Treatable: Evidence Based Treatments

Trauma Focused Psychotherapy

- Cognitive behavioral therapy
- Prolonged Exposure
    - Gradual approach to trauma triggers
- Cognitive Processing Therapy
    - Modification of trauma beliefs

Pharmacotherapy

- Sertraline (Zoloft), Paroxetine (Paxil), Fluoxetine (Prozac)
- Venlafaxine (Effexor)

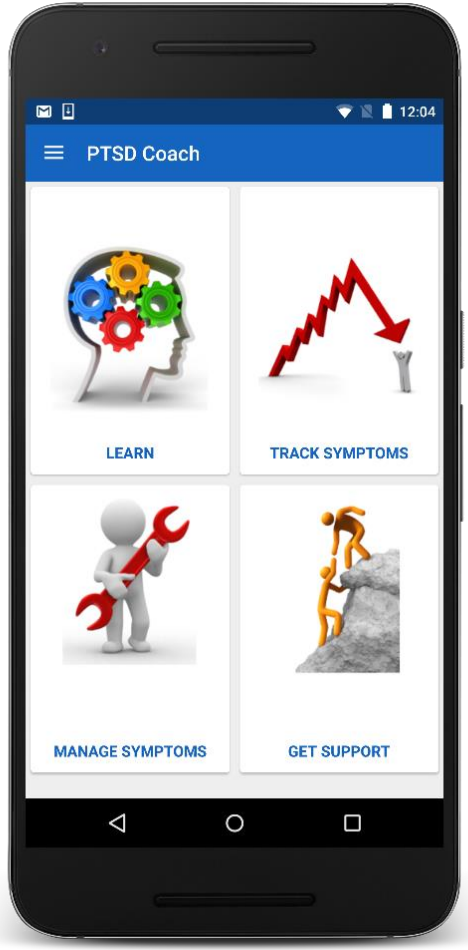
Agents targeting specific symptoms/comorbid disorders

- Insomnia-Trazodone
- Nightmares-Prazosin

PTSD Coach*

App-based intervention to self-manage symptoms

- Learn about PTSD
- Track symptoms and triggers
- Practice healthy coping skills
- Build support networks



* US Department of Veterans Affairs

Major Depressive Disorder (MDD)

Diagnostic Features

- persistent feelings of extreme sadness, loss of interest/pleasure
- excessive guilt, worthlessness, helplessness, hopelessness
- sleep, appetite, cognitive impairment, fatigue
- thoughts of death or suicide

- Cause significant distress or impairment in function
- Not attributable to effects of substance or medical condition

*adapted from Diagnostic and Statistical Manual of Mental Disorders (DSM-5VR)

Depression Screening

- Routine screening in general medical settings supported by most CPG
- Why screen? Identify and treat/refer
- MDD treatment by non-specialists is common and safe
- Suicide prevention strategy
- ~ 50% of patients had contact with primary care within a month before death by suicide

Ahmedani et al., Health care contacts in the year before suicide death. *J Gen Intern Med*. 2014;29(6):870-877.

MDD Screening: Patient Health Questionnaire (PHQ-2, PHQ-9)

Over the last 2 weeks, how often have you been bothered by any of the following problems? 0= Not at all to 3= Nearly every day

PHQ-2

1. Little interest or pleasure in doing things
2. Feeling down, depressed, or hopeless

PHQ-9: Adds MDD symptoms and suicide risk question

Thoughts that you would be better off dead or of hurting yourself in some way

https://www.apa.org/depression-guideline/patient-health-questionnaire.pdf

Screening: Patient Health Questionnaire (PHQ-9)

https://www.apa.org/depression-guideline/patient-health-questionnaire.pdf

Over the last 2 weeks, how often have you been bothered by any of the following problems? 0 = Not at all to 3 = Nearly every day

1. Little interest or pleasure in doing things
2. Feeling down, depressed, or hopeless
3. Trouble falling or staying asleep or sleeping too much
4. Feeling tired or having little energy
4. Poor appetite or overeating
5. Feeling bad about yourself, that you are a failure, let yourself, your family down
7. Trouble concentrating on things, such as reading the newspaper or watching TV
8. Moving or speaking so slowly that other people could have noticed? Or the opposite …
9. Thoughts that you would be better off dead or of hurting yourself in some way

Always ask questions 1 and 2.	Past Month	
1) Have you wished you were dead or wished you could go to sleep and not wake up?		
2) Have you actually had any thoughts about killing yourself?		
If **YES** to 2, ask questions 3, 4, 5 and 6. If **NO** to 2, skip to question 6.		
3) Have you been thinking about how you might do this?		
4) Have you had these thoughts and had some intention of acting on them?	High Risk	
5) Have you started to work out or worked out the details of how to kill yourself? Did you intend to carry out this plan?	High Risk	
Always Ask Question 6	Life-time	Past 3 Months
6) Have you done anything, started to do anything, or prepared to do anything to end your life? *Examples*: Took pills, tried to shoot yourself, cut yourself, tried to hang yourself, took out pills but didn't swallow any, held a gun but changed your mind or it was grabbed from your hand, went to the roof but didn't jump, collected pills, obtained a gun, gave away valuables, wrote a will or suicide note, etc. **If yes, was this within the past 3 months?**		High Risk

Suicide risk assessment:

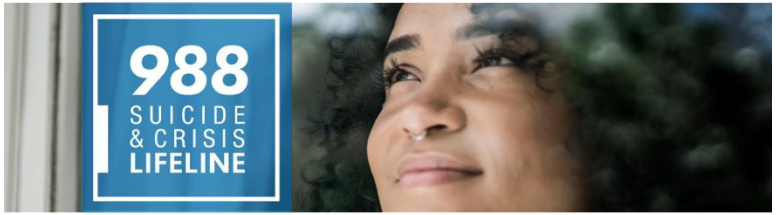
Columbia Suicide Severity Rating Scale (C-SSRS)

If YES to 2 or 3, seek behavioral healthcare for further evaluation.
If the answer to 4, 5 or 6 is YES, get immediate help: Call or text 988, call 911 or go to the emergency room.
STAY WITH THEM until they can be evaluated.

[The Columbia Lighthouse Project](https://cssrs.columbia.edu/)

https://cssrs.columbia.edu/

Suicide Prevention Interventions



- Engage family and support network
- Assist with referral
- Provide brief follow-up contacts
- Lethal Means Counseling
- Offer crisis resources: 988 Suicide and Crisis Lifeline
  - Confidential, free, available 24/7/365

Lethal Means Counseling: Recommendations for Providers (va.gov)

MDD Treatments

First-line treatments

- Psychotherapy
- Pharmacological Treatment
- Combined treatment may enhance response

VA/DoD CPG for the Management of Major Depressive Disorder (2022)

MDD Psychotherapy

- Cognitive behavioral therapy
- Self-help, peer support groups
- Individual or group format

MDD Pharmacotherapy

- Selective serotonin reuptake inhibitors (SSRIs)
- Serotonin-norepinephrine reuptake inhibitors (SNRIs)
- Others: e.g., bupropion

- Insomnia: non-benzodiazepines (trazodone, zolpidem)
- Lifestyle modification (exercise, mindfulness) support overall physical and emotional health

American Psychological Association (2019) Clinical practice guideline for the treatment of depression across three age cohorts.

Substance Use Disorders

Alcohol use disorder (AUD)

The Management of Substance Use Disorders: Synopsis of the 2021 U.S. Department of Veterans Affairs and U.S. Department of Defense Clinical Practice Guideline - PubMed (nih.gov)

Substance Use Disorders in 9/11 Exposed Persons

- > 60% of patients with PTSD meet lifetime criteria for SUD*
- > 10 years post 9/11: Increased prevalence and intensity of binge drinking and among highly exposed responders
- > 15 years post 9/11: Binge drinking to intentionally self-medicate PTSD symptoms
- Hospitalizations and alcohol related mortality significantly elevated in responders with AUD and probable PTSD

Vlahov, et al., 2004; Garrey, et al, 2020; Takemoto, et al, 2021; * National Epidemiologic Survey on Alcohol and Related Conditions 2015

SUD: Diagnostic Features

"A cluster of cognitive, behavioral, and physiological symptoms indicating that the individual continues using the substance despite significant substance-related problems."

- Clinically significant impairment or distress over 12 months
- impaired behavioral control
- social impairments
- neuroadaptation (dependence)

The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5)

Alcohol Use Disorders Identification Test Consumption (AUDIT-C)

Periodic screening recommended by VA/DoD CPG

AUDIT- C

		0	1	2	3	4	Score
1.	How often do you have a drink containing alcohol?	Never	Monthly or less	2 to 4 times a month	2 to 3 times a week	4 or more times a week	-
2.	How many drinks containing alcohol do you have on a typical day when you are drinking?	1 or 2	3 or 4	5 or 6	7 to 9	10 or more	-
3.	How often do you have more than five or more drinks on one occasion?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	-

Total Score_____

AUDIT-C: Males ≥ 4 is positive screen; Women ≥ 3 is positive screen

Five A's of Brief Intervention

All providers serve a role in SUD screening, brief intervention, and referral

ASK	• Questions about substance use
ADVISE	• Patient to stop or cut down
ASSESS	• Willingness change
ASSIST	• To make change if ready
ARRANGE	• Referral, follow-up

SUD Treatment

CPGs support combination of pharmacologic, psychotherapeutic, and psychosocial interventions

Psychotherapy/Psychosocial Strategies

- Motivational Interviewing
- Mutual Help Programs (AA)
- Cognitive Behavioral Therapy
- Couples and Family Therapy

Medication

- Naltrexone
- Acamprosate
- Topiramate

Clinical Challenge: Co-occurring PTSD and Substance Use Disorders Concurrent Treatment

Best Practices for Disaster Exposed Populations

- Routine screening/surveillance
- Integrated Treatment: Medical, psychological, and psychosocial interventions for co-occurring conditions are delivered simultaneously
- Case management
- Refer and follow-up

What Have We Learned?

- Health outcomes of 9/11 psychological exposure vary and are mediated by complex interaction of factors
- Enduring symptoms pose an ongoing public health burden
- Challenges: chronic illness, aging, emerging conditions
- Need for long-term health monitoring/screening for physical and psychological symptoms
- Healthcare: Include integrated medical, psychiatric and psychosocial services
- Workplace prevention: Offer education, training, support

More than two decades after 9/11, the WTCHP maintains a critical role in caring for exposed workers

David Jugan

With deep appreciation to the 9/11 responders and survivors, the healthcare providers committed to caring for them, and the communities who support them.

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