First Responders: Mental Health Consequences of Natural and Human-Made Disasters for Public Health and Public Safety Workers*

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Abstract

First responders, including military health care workers, public health service workers, and state, local, and volunteer first responders serve an important role in protecting our nation's citizenry in the aftermath of disaster. Protecting our nation's health is a vital part of preserving national security and the continuity of critical national functions. However, public health and public safety workers experience a broad range of health and mental health consequences as a result of work-related exposures to natural or man-made disasters. This chapter reviews recent epidemiologic studies that broaden our understanding of the range of health and mental health consequences for first responders. Evidence-based psychopharmacologic and psychotherapeutic interventions for posttraumatic distress reactions and psychiatric disorders are outlined. Finally, the application of public health intervention models for the assessment and management of distress responses and mental disorders in first-responder communities is discussed.

INTRODUCTION

The terrorist attacks of September 11, 2001, focused the attention and energy of the United States on the "global war on terrorism" and the Nation's security. This was further emphasized by the anthrax attacks of 2001, the response and recovery efforts of the 2004 Southeast Asia tsunami, the multiple hurricanes that struck Florida in 2004, and hurricanes Katrina and Rita in 2005. Natural and human-made tragedies (e.g., war) have demonstrated the extent to which our national infrastructure can be threatened, damaged, or destroyed by disasters. These events have emphasized the important role of our public health and public safety first responders—including uniformed services, military and public health, and state, local, and volunteer first responders—in protecting our nation's citizenry in the aftermath of disaster.

The definition of "public health workers" is somewhat arbitrary. Police, firefighters, search and rescue personnel, and emergency and paramedical teams are included in most definitions and have been studied most extensively. However, nurses, physicians, laboratory personnel, and ancillary hospital staff have also played important roles in the responses to recent natural disasters in the United States and abroad, in rescue-and-recovery operations after terrorist attacks, and in the identification, management, and treatment of infectious outbreaks such as SARS. These providers will no doubt play important roles in response to future natural and human-made disasters, in particular an Asian influenza pandemic. Truck drivers, heavy equipment operators, laborers and carpenters have also worked (and continue to work) to restore basic needs such as shelter and workspace in the aftermath of natural disasters, limiting the spread of infection or disease related to environmental exposure or malnutrition. Others have assisted in the recovery of human remains, reducing infection and bringing a degree of closure to survivors of deceased victims. These efforts, which augment the roles of traditional first responders, call for an expanded definition of "first responder" and may also suggest an expanded definition of "public health worker." Regardless, protecting the health of care providers and other responders is an important aspect of disaster recovery and of preserving continuity of critical community functions.

Within various responder groups, the potential negative emotional consequence of disaster work resulting from exposures to traumatic events, high levels of work demand, work with disrupted communities and evacuee populations, and separation from home and loved ones has been the subject of considerable investigation. Acute stress disorder (ASD) and acute and chronic posttraumatic stress disorder (PTSD) are the focus of considerable study (3). The broad range of posttraumatic reactions which can affect health, performance and morbidity include not only these disorders but also subclinical emotional symptoms (e.g. fear), altered health risk behaviors and other traditional disorders. Ultimately, healthy adjustment (resilience) should be expected in most, however, traumatic responses include: distress, worry, disturbed sleep or concentration, alterations in work function, difficulties with interpersonal relationships, increase in substance use, somatization, and depression (8, 25). Response to loss of loved ones or significant others may include symptoms of traumatic grief (24) or complicated grief (39, 43). The intertwined nature of distress related behaviors, sign and symptoms of mental disorders, and distress responses not amounting to diagnosable mental disorders are depicted in **Figure 1**.

In the following pages we review the spectrum of emotional and behavioral consequences of traumatic events as part of understanding the effects of disaster work on public health responders. We address recent advances in our understanding of the health, particularly mental health, consequences of disaster in public health workers and

individual patient treatment, population-based approaches, and public health intervention strategies for mental health consequences in disaster-affected communities. Public health planning and response must address these needs of public health first responders.

CONSEQUENCES OF TRAUMATIC EVENTS

Psychological and physical responses to traumatic events (e.g., actual or threatened death or serious injury) vary with the social context of the event, biological and genetic makeup, and past experiences and expectations. These factors interact with the characteristics of the traumatic event (e.g., cause, intensity, duration of exposure, availability of medical and psychosocial support) to produce psychological and behavioral responses that range from resilience to disability.

Three categories of response and their needed interventions have been described (25):

- Most people may experience mild, transient distress such as sleep disturbance, fear, worry, anger, or sadness or increased use of tobacco or alcohol. Persons experiencing such responses may return to normal function without treatment but might benefit from community-wide support and educational interventions.
- A smaller group may experience moderate symptoms such as persistent insomnia or anxiety or changes in travel patterns or workplace behavior. Although these changes would not necessarily meet threshold criteria for disease or disorder, such symptoms may affect work or home functionality. These symptoms will likely benefit from psychological and medical intervention.
- A smaller subgroup may develop psychiatric illness such as PTSD or major depression and will require specialized treatment.

Epidemiologic studies in the aftermath of natural disaster and terrorism have identified subpopulations at particular risk for severe outcomes. These include children, the elderly, those with chronic mental and physical illness, and those with limited social support (19). The number of people experiencing symptoms from each of the three severity categories varies with the nature of the event (e.g., man-made deliberate attacks have generally been associated with greater pathology than natural disasters have). Proximity, duration, and intensity of exposure are the most significant predictors of outcome severity.

POSTTRAUMATIC CONSEQUENCES AND PUBLIC HEALTH WORKERS

Health Care Providers in High-Stress Environments: Life Threat, Trauma, and Terrorism Exposures

Our understanding of the effects of high-stress environments on health care providers has progressed considerably through the study of health care delivery in military conflict and peacekeeping missions. In the health care populations where combat or threat of personal injury is minimal (44), symptoms of depression and anxiety were noted. However, investigators have observed long-term disability in health care workers working in life-threatening military environments. Carson et al. (12) studied Vietnam nurses with PTSD from their wartime experiences, decades after their return from war. Even at this late time, this group experienced significant physiologic response to scripts describing their work with injured soldiers. Many of these nurses had been exposed to life-threatening events during their wartime experiences, but the extent to which PTSD resulted from observation of the injuries of others, personal threat or injury, or an interaction of these factors was not clarified. Grieger et al. (21) studied tertiary care hospital workers (physicians, nurses, and

support personnel) who deployed on a hospital ship during Operation Iraqi Freedom and compared responses to nondeployed workers from the same hospital. In this relatively small sample, degree of exposure to the dead or injured others was not a significant risk factor for PTSD or depression. However, perceived threat of harm to self predicted the subsequent development of PTSD. Rates of depression, PTSD, and health care and mental health care utilization in the deployed group were significantly higher than in nondeployed controls. This study suggested that in a group of experienced military health care workers, threat of personal harm in the high-stress environment of the combat theater setting was important in predicting illness and health care utilization for care providers returning from a military combat–related deployment.

Nurses practicing in hospital settings requiring routine and repeated exposure to seriously injured trauma victims show higher levels of general anxiety than do their less-exposed counterparts (27). A recent study of Turkish health care workers (1) found that those reporting traumatic exposure—from either natural disaster or terrorist event—acknowledged PTSD symptoms at twice the rate of those without traumatic exposure. However, this study did not differentiate between exposure to disaster or exposure to terrorism, nor did it distinguish the nature of the traumatic exposures (observed injury to others versus perceived threat of injury to self). Moreover, Akbayrak et al. (1) did not use established criteria for the diagnosis of PTSD or other specific psychiatric disorder and demonstrated only the presence or absence of emotional, physical, or cognitive symptoms related to defined illnesses.

In a study of health care workers following the Washington, D.C., sniper attack, Grieger et al. (21) found increased alcohol use, depressive symptoms, and PTSD symptoms as well as altered safety behaviors (e.g., driving habits, participation in public events). As with other surveys of health care workers, this study was limited by the small sample size and retrospective, self-reported symptom quantification. However, the study suggested, again, that health care workers are not immune to the psychological consequences of terrorism. In sum, these studies of health care providers working in nontraditional high-stress environments suggest the need for greater study of the degree to which personal risk, exposure to the injury of others, and the requirement to deliver care away from one's usual workplace may interact to produce behavioral changes, distress, or disorder in health care workers.

Health Care Workers and Epidemics

Studies of the psychological effects of epidemics on health care workers are limited. Bai et al. (5) examined health care workers ($N = 402$ care providers, and $N = 155$ administrators) at a veteran's hospital in Taiwan shortly after 57 hospital workers had been quarantined as a result of the SARS epidemic. Five percent met American Psychiatric Association Diagnostic and Statistical Manual, Fourth Edition (DSM-IV) criteria for ASD, and quarantine itself was the strongest predictor of this diagnosis. Twenty percent reported experiencing feelings of stigmatization and rejection in their home neighborhoods. Nine percent of the health care workers reported either a reluctance to work and/or considered resigning in the period surrounding the quarantine. Results indicated that psychological disorder and distress, as well as the potential for health care worker absenteeism, were important in planning for future epidemics. The hospital surveyed was not a SARS treatment facility so the extent to which rates of distress and absenteeism might be more (or less) of a factor in a facility dedicated to epidemic treatment remained subject to speculation.

Maunder et al. (29) examined patients and treatment personnel in a SARS treatment facility during an outbreak. They found incidents of professional isolation (as a result of mask use and recommendations to avoid unnecessary contact with fellow workers),

diminished morale in some care providers, and professional and administrative work-refusal during the height of the outbreak. Public health planning for work absence and workforce morale are indicated.

Firefighters

Some first responders must confront the injuries and death associated with natural disaster, at times under the threat of personal injury. Bryant's early studies of volunteer firefighters in Australia (9, 10) noted that proximity to death, severity of trauma, and perceived threat were all associated with the development of posttraumatic symptoms and PTSD. Subsequent study (6) confirmed perception of threat to self as highly stressful to firefighters, but it suggested that "routine" aspects of duty such as performing CPR may be stressful to firefighters. Also contributing to symptom development were disaster-related postdisaster personal events such as loss of a loved one, unemployment, and involvement in subsequent critical incidents. In a longitudinal study of Australian firefighters, 77% of the subjects who had developed PTSD had a comorbid psychiatric diagnosis such as depression, panic disorder, or phobic disorders (31). These studies highlight that for first responders, just as in the disaster-affected community, disasters do not occur in a vacuum. Their significance must be interpreted in light of other social and interpersonal events that may occur as a result of the disaster itself or may be unrelated.

Studies of firefighters have generally found rates of PTSD ranging from 13% to 18% 1–4 years following large-scale response events (20, 31, 35). Heinrichs et al. (23) reported a 2-year prospective follow-up of 43 firefighters assessed initially at completion of basic training and then at 6, 9, 12, and 24 months for symptoms of depression, PTSD and anxiety, biological makers of stress (salivary cortisol and 24-hour urine catecholamine excretion), and a variety of personality traits. Investigators did not measure symptoms related to a specific traumatic event. Although biological markers did not predict symptoms, the investigators found that a high level of hostility and a low level of self-efficacy accounted for 42% of the variance in posttraumatic stress symptoms after 2 years. Moreover, subjects who had both risk factors at baseline had significant increases in measures of PTSD symptoms, depression, anxiety, general psychological morbidity, and global symptom severity during the two-year period. These results suggested that specific personality traits may constitute markers in one's vulnerability to psychopathological symptoms after trauma exposure in populations of public health first responders.

In a longer-term study Morren et al. (32) compared 246 volunteer firefighters, who deployed in response to a technological disaster, with 71 nondeployed controls in a questionnaire assessing perceived health and health change, mental health problems, and health care utilization. Three years after the disaster no health differences emerged between deployed and nondeployed firefighters, although disaster-related experiences (e.g., rescuing victims, fire extinguishing, and body recovery) predicted posttraumatic stress symptoms, health care utilization, and mental health care utilization. As earlier studies of firefighters (9, 10) have shown, distressing experiences unrelated to the disaster were predictors of health problems and health care utilization.

Police Officers

In a study comparing 709 police officers with 317 civilians exposed to a variety of critical incidents, Fikretoglu et al. (18) asked survey respondents to answer questions measuring critical incident exposure, PTSD criterion A2 (reaction of fear, helplessness, or horror), panic, and dissociation. Results suggested that panic symptoms mediated the relationship between fear, helplessness or horror responses, and dissociation in civilians, while only partially mediating that relationship in police officers. The study supports the theory

that extreme fear may mediate the development of PTSD. Police and those not trained (civilians) may differ in the mechanisms of developing PTSD. In a study of potential biomarkers for stress in 100 Buffalo, NY, police officers, Violanti et al. (50) measured salivary cortisol, carotid artery thickness, and flow-mediated dilation and surveyed for depression and PTSD. They found higher rates of depression, PTSD, and carotid artery parameters in policemen than in an aged-matched population. This study suggests the possibility of an anatomical marker of exposure to chronic stress.

Otte et al. (37) exposed 75 police academy recruits to a video depicting real-life officers exposed to highly stressful incidents and measured salivary cortisol and 3-methoxy-4-hydroxy-phenylglycol (MGPG, the major metabolite of norepinephrine) at baseline, immediately after, and 20 min after the video, comparing those recruits with a history of childhood trauma ($n = 16$) with the remainder of the sample. Although both groups exhibited a cortisol and catecholamine response, those with childhood trauma had an increased MGPG response. Although self-reports of childhood trauma or lack thereof were not corroborated and sample size was relatively small, investigators suggested that this exaggerated response could serve as a risk factor for anxiety disorders in recruits who were subsequently exposed to work-related trauma and could indicate a potential preventive role for medications known to reduce catecholamine output in response to stress in similar populations.

In a sample of 1000 emergency workers in South Africa, Ward et al. (51) found an association between traumatic exposure and general psychopathology, symptoms of PTSD, and aggression between coworkers. Overall, higher rates of exposure across public health worker types were reported in their population than in surveys of Western nations. Police demonstrated higher rates of general psychopathology than did ambulance, fire, and sea rescue service workers.

Emergency Medical Technicians and Others Involved in Search-and-Rescue Operations

Alvarez & Hunt (2) compared 82 canine search-and-rescue handlers, deployed to assist in recovery operations in the aftermath of the 9/11 terrorist attacks, with 32 nondeployed handlers on measures of PTSD, depression, anxiety, acute stress, and other diagnoses. Deployed handlers reported more PTSD and general psychological distress six months after 9/11. Among deployed handlers, prior psychiatric diagnosis and peritraumatic dissociation were associated with higher levels of psychological distress, whereas degree of social support and prior training were protective. Although the elevated rates of distress and symptoms of PTSD in deployed handlers were consistent with previous studies indicating greater risk for emergency workers, levels of PTSD severity were lower than in previous studies of emergency workers. Investigators speculated search-and-rescue animal workers may be more resilient than other emergency workers as a result of undefined characteristics unique to this population or to factors related to the potentially protective effects of working with companion animals.

Fullerton et al. (20) conducted a large-scale prospective study of exposed disaster workers including EMTs, firefighters, and police officers assigned to an airport disaster response team after a DC-10 crash and explosion resulting in 112 deaths and 59 serious injuries. Two hundred seven (207) of the 440 exposed disaster workers contacted were compared with 421 of 700 disaster workers assigned to a similar team at a similar-sized community and airport 90 miles away. Among their findings, exposed disaster workers had significantly higher rates of ASD, PTSD at 13 months, and depression at 7 months and 13 months following the crash. Disaster workers with ASD were nearly 4 times more likely to be depressed at 7 months, and those with ASD and high exposure and previous disaster experience were more likely to develop PTSD. As

with studies of deployed health care workers, exposed workers sought and obtained more medical care for emotional problems than did comparison subjects at 2, 7, and 13 months. This prospective study, the first to assess for ASD in disaster workers, found rates of ASD (25%) comparable to those in a previous study of motor vehicle accident survivors. Those with ASD were 7.33 times more likely to meet PTSD diagnostic criteria at 13 months. Future health care planning for disaster workers should address workers' increased risks for ASD, PTSD, and depression.

Fullerton and colleagues' study is noteworthy for its prospective nature and large sample size. Earlier prospective studies of emergency services personnel suggested that dissociation near the time of traumatic exposure predicted subsequent development of PTSD in a mixed sample of firefighters, police, paramedics, emergency medical technicians, and highway department workers (28, 53). Other recent larger sample studies of rescue workers have noted similar rates of posttraumatic symptoms in the aftermath of response to explosions. These studies do not report differences in symptoms by first responder type. However, in their sample of 3792 residents, passers-by, and rescue workers exposed to a large fireworks factory explosion, van Kamp et al. (49) found higher rates of posttraumatic mental health and physical symptoms in responding rescue workers residing in proximity to the explosion than those workers deployed to provide assistance from remote locations.

Human Remains and Body Recovery

In mass disaster situations, exposure to dead bodies and remains has been reported to be especially stressful for disaster workers. In a study of forensic dental identification workers (30), the remains handlers had higher traumatic stress symptoms than did the control group; distress was related to remains exposure and age. Interestingly, more experienced workers reported that support from

coworkers was most important, whereas for those with less experience, support from family was more important. Certain features of dead bodies are especially disturbing; they include badly damaged bodies, natural-looking bodies, and children's bodies. Identification ("it could have been me" and "it could have been my child") and emotional involvement with the deceased victims were risk factors for PTSD in disaster workers exposed to the dead (14, 48).

Nontraditional First Responders

The recovery and response to natural as well as man-made disasters require the integrated efforts of traditional public health responders, firefighters, police, EMTs search and rescue, and hospital-based providers. However, construction engineers, heavy equipment operators, mechanics, carpenters, and laborers work to remove rubble from debris piles (allowing for further rescue and recovery); rebuild roads to allow for transportation of the sick, injured, or dead as well as needed food and supplies for survivors and rescue workers alike; and resurrect or rebuild shelters and lines of communication for these victims and responders. Their immediate proximity to disaster sites may also prompt or necessitate participation in medical aspects of recovery operations more traditionally associated with previously defined public health workers. In addition, they often perform their work in treacherous conditions.

The physical effects of labor under such conditions include musculoskeletal injury, eye injuries, and hearing loss, as well as consequences of infectious disease. Increased incidence of psychological, musculoskeletal, and respiratory complaints of traditional and nontraditional responders have been demonstrated in the aftermath of intentional, terrorist-related bombings (32) and industrial accidents resulting in explosion (17). The psychological effects on "nontraditional" public health responders are also now being specifically studied. Johnson and colleagues (26) surveyed truck drivers, heavy equipment

operators, laborers, and carpenters involved in recovery operations at the World Trade Center after the 9/11 attacks. Of the 1114 surveys returned, 332 workers responded to an open-ended narrative question about their experience detailing debilitating physical consequences, depression, drug use, and symptoms of PTSD. Clearly there are methodological limitations to analysis of any attempt to interpret quantitatively responses to an open-ended narrative survey question. However, the fact that 30% of those asked chose to share painful physical and emotional symptoms with researchers suggest that this group of responders, whose efforts clearly serve the public health, must also be further examined. Beyond 9/11, the fact that our current federal and local emergency response plans require the efforts of such workers (and still others will volunteer) suggests a need to anticipate the mental health needs of this population in planning for the needs of public health workers in the aftermath of war, terrorism, natural or man-made disaster, or epidemic.

PREVENTION, ASSESSMENT, AND MANAGEMENT STRATEGIES

The psychological and behavioral consequences for individuals and communities of public health workers affected by disaster are needed in any plan for interventions before, during, and after a disaster. Recent publications have also been developed for mass violence intervention and psychological first aid and risk communication to assist in population health interventions for groups and communities, including for first responders. Professional organizations and institutions, including the U.S. Departments of Defense and Veterans Affairs and the American Psychiatric Association have developed and published practice guidelines for the treatment of depression and also for the treatment of ASD and PTSD. These syntheses of research and expert consensus augment clinical experience in treating patients, educating the public,

guiding research, and establishing credibility for medical care delivery.

Population-Based Interventions

Public education is an important part of population-based interventions to provide knowledge, reassurance, and guidance to foster helpful self-care. In addition, leadership exercising good risk communication skills (e.g., saying what is currently known, what is not yet known, and when new information will be available) can greatly aid community cohesion and constructive actions (19, 34, 46). Public health interventions can both limit distress and alter health risk behaviors (e.g., increased smoking and alcohol consumption). In this way, such information and education can restore communities, families, and workplaces and reduce the postdisaster mental health burden of distress and possible illness (47).

An emerging model of early intervention after disaster recommended by expert panelists is psychological first aid (32, 33, 42, 52). One component of psychological first aid is the establishment of a sense of safety (e.g., through evacuation or protection from retraumatization). Other components include facilitation of social connectedness, fostering optimism, decreasing arousal, and restoring a sense of self-efficacy through psychoeducation, basic relaxation training, and cognitive reframing (13) (see **Table 1**). Models using multidisciplinary or critical incident needs assessment teams (CINAT) to assist in the implementation of psychological first aid in the workplace, to identify at-risk individuals and groups, and to provide consultation to leadership around risk communication, grief leadership (actions to facilitate adaptive responses to the loss of coworkers), and psychological consequence mitigation strategies within the work place have been described (7) (see **Table 2**). Police, firefighters, and heavy equipment operators, all represent public health workforces that may establish individual headquarters or operations center sites

Table 1 Principles of psychological first aid

- Safety: Develop a physically safe environment; identify safe areas and behaviors
- Efficacy (individual and community): Maximize individuals' ability to care for self, family, and others through measures, clear policies, guidance (e.g., evacuation or shelter-in-place procedures; mechanisms for obtaining food, shelter, vaccination, medical care)
- Calmness: Teach and encourage relaxation and calming skills and maintenance of natural body rhythms (e.g., nutrition, sleep, rest, exercise)
- Connectedness: Maximize and facilitate connectedness to family and other social supports to the extent possible
- Foster hope and optimism without minimizing ongoing risks

within a larger disaster response environment. This was the case in the environs surrounding the Pentagon after the 9/11 attacks. Here, multidisciplinary teams as described above provided initial triage, psychosocial support, referral for further assessment or treatment, and leadership consultation to public health workers and volunteers using just such an approach (36). The extent to which similar teams using this approach might be applied to the various populations of public health responders before, during, and after other disasters warrants further investigation.

Psychological first aid can be one component of a deployable team to assist in providing care and assessing needs of various first-responder groups. This team has been called a CINAT (critical incident needs assessment team) and is usually composed of several professionals: psychiatrist, psychologist, social worker, and often clergy and administrative assistance. This team can meet with leadership of, for example, a police or firefighter unit, assess various individuals, and review organizational support and resources to provide a plan for psychological help, support, and special attention for any high-risk groups (22).

Specialty Care

Psychopharmacology. Although pharmacological treatment soon after trauma exposure may prevent the development of ASD or PTSD, existing evidence should be considered only preliminary. Given the significance of noradrenergic mechanisms within the amygdala in the consolidation of memory and learning of fear in response to stressful events, it is not surprising that disruption of this process with postsynaptic beta-blocking agents has been proposed as a preventive intervention. Preliminary studies of beta-blockers administered acutely after traumatic exposure have demonstrated reductions in physiological correlates of PTSD and trends in the reduction of PTSD symptoms but have not yet demonstrated efficacy in preventing the development of the syndrome (38). Thus, existing practice guidelines make no specific recommendations regarding pharmacologic intervention for the prevention of ASD or PTSD. For persons with ASD, the use of selective serotonin reuptake inhibitors (SSRIs) and other antidepressants is supported by limited research in ASD and by findings of considerable clinical benefit in persons with PTSD. Although depression is a highly recurrent illness associated with re-exacerbations under

Table 2 Critical Incident Needs Assessment Team (CINAT) functions in workplace/workforce response to a Public Health Emergency

- Institute a pre-clinical, multidisciplinary team approach
- Identify high-risk groups/individuals
- Target mental health, resilience, distress, and risk behaviors
- Identify barriers to care and services
- Offer health education for prevention, assessment, and referral
- Hold informational briefings (leader participation)
- Offer grief leadership
- Integrate family support into worker/workplace support

stress, practice guidelines do not suggest the prophylactic resumption of antidepressant therapy in disaster-exposed individuals.

SSRIs are considered the first-line medication treatment for PTSD. In both male and female patients, treatment with SSRIs has been associated with reductions of core PTSD symptoms in all three symptom clusters. SSRIs are also considered a first-line choice in the treatment of postdisaster depressive illness. Their safety and side-effect profile, their coindication for PTSD, and high rates of comorbidity between these illnesses suggest SSRI treatment if depression does reoccur in the after trauma. Other antidepressants, including tricyclic antidepressants (TCAs) and monoamine oxidase inhibitors (MAOIs), have demonstrated efficacy in earlier—and in some cases less rigorous—studies (4). More recently, prazosin, a centrally active alpha-1 receptor antagonist has been shown to reduce trauma-related nightmares and overall levels of PTSD in a series of combat veterans and other trauma victims (40).

Benzodiazepines appear to reduce anxiety and improve sleep. They also oppose norepinephrine's memory-potentiating activity in the amygdala (although to a lesser degree than do beta blockers). They are often used in trauma-exposed individuals including those with PTSD. Their efficacy in treating the core symptoms of PTSD has not been established. Because of observations including increased incidence of PTSD after early treatment, worsening symptoms upon withdrawal, and the possibility of dependence, benzodiazepines are not recommended as monotherapy for PTSD (4).

Limited studies suggest that second-generation antipsychotic medications (e.g., olanzapine, quetiapine, and resperidone) may be helpful in some patients with PTSD. Although flashbacks and intrusive symptoms are considered to be distinct from psychotic phenomena, the similarity between particularly intense flashbacks and other impairments in reality testing may provide a partial explanation for these observations. The neurophysiological kindling model suggests a theoretical basis for the anticonvulsant medications (e.g., divalproate, carbamazepine, topiramate, and lamotrigine) in terms of preventive as well as therapeutic efficacy. Although preventive effects have not been quantified, limited studies suggest therapeutic benefit particularly in the reexperiencing symptom cluster with these agents (15).

Psychosocial interventions. Some evidence supports the effectiveness of psychotherapeutic approaches immediately after trauma in preventing the development of ASD, PTSD, and depression. Cognitive behavioral therapy (CBT) attempts to correct cognitive distortions (e.g., overgeneralization of threat levels) and reduce the frequency and symptomatology associated with traumatic memories by re-exposure (imagined or in vivo) in a controlled setting. Studies of CBT in rape and sexual assault victims as well as motor vehicle and industrial accident survivors suggest that CBT delivered over a few sessions in the weeks following trauma may speed recovery and prevent the development of PTSD (4).

Imagery rehearsal, prolonged exposure, cognitive processing (CPT), and virtual reality therapies share with traditional CBT the incorporation of one element: progressive and guided re-exposure to traumatic recollections as part of the therapeutic process. The other exposure-based psychotherapies have received less attention in clinical trials. CPT has demonstrated good outcomes in a group setting with sexual assault victims; however, the degree to which this would translate to success in a postdisaster setting has not been examined (41). Eye movement desensitization and processing (EMDR) combines a reexposure element with eye movement, memory recall, and verbalization. Numerous studies have demonstrated the efficacy of CBT in reducing symptoms of PTSD. EMDR has also been widely studied and appears effective most likely because of the well-studied CBT component. Present

studies indicate that the eye-movement component of the treatment is not necessary (16).

The theory that mass traumatic exposure could lead to the development of ASD or PTSD symptoms in large groups or communities was recognized long before it was confirmed in epidemiologic studies of combat veterans or survivors of the September 11th terrorist attacks. Military commanders have long used after-action reviews to evaluate the effectiveness of and damage resulting from combat operations, in part to mitigate the emotional effects of participation in such activities. More recently, this process has evolved into a number of techniques applied to groups of law-enforcement personnel, emergency service providers, and civilians, collectively referred to as psychological debriefing. The critical incident stress debriefing (CISD) is a popular form of a semistructured, staged, group psychological debriefing. Although many who receive debriefing experience the process as beneficial, there is no evidence to suggest that debriefings prevent PTSD, and some studies suggest that the process may be harmful (11). The current American Psychiatric Association practice guidelines do not recommend CISD or other forms of psychological debriefing for the prevention or treatment of ASD or PTSD. The guidelines do call for the development of population-based approaches to exposure to mass violence aimed at the reduction of distress and maladaptive distress behavior in communities and populations as well as the prevention of acute ASD and PTSD (4).

CONCLUSION

First responders to natural and human-made disasters may be called to aid communities and therefore our nation after hurricanes, terrorism, or a pandemic. The modern definition of first responder must now include both traditional public safety workers (e.g., police, firefighters) and public health workers and nontraditional responders who help reconstruct the community's health and safety infrastructure in extreme conditions. This population includes individuals whose work necessitates prolonged, intense exposure to the death, injury, and destruction wrought by disasters. Recent studies demonstrate that the range and severity of psychological responses varies with characteristics of the disaster, the particular responders, and the nature of past traumatic experience and training, and with events that occur and support that is present after the disaster. Further research is needed to identify those factors that may best predict the traumatic sequelae of a given exposure in a given responder or responder population. In addition, further research is needed to inform preventive strategies and treatments for specific disorders to promote maximal efficaciousness in individual patients or subpopulations of public health workers. Last, current models of population-based preventive approaches using preparedness training, education, and supportive measures, including psychoeduction and psychological first aid, should be evaluated in populations of public health workers responding to disasters, terrorism, and other public health crises.

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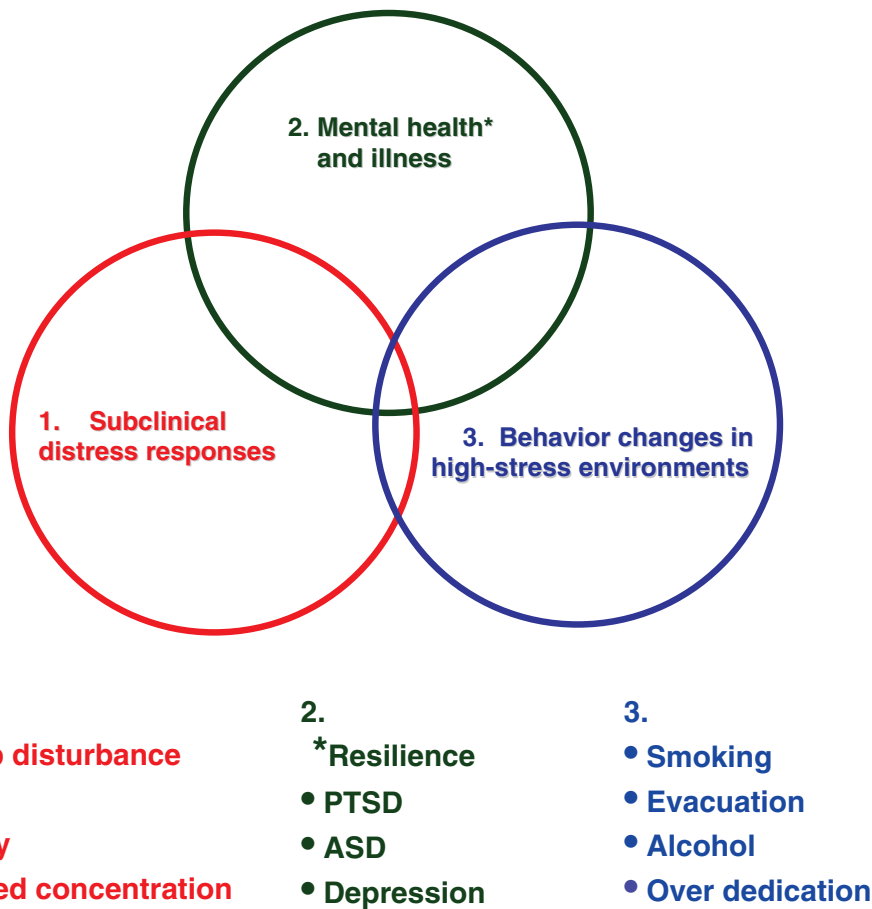
2. Mental health*
and illness

1.   Subclinical
distress responses

3. Behavior changes in
high-stress environments

1.
- **Sleep disturbance**
- **Fear**
- **Worry**
- **Altered concentration**

2.
- ***Resilience**
- **PTSD**
- **ASD**
- **Depression**

3.
- **Smoking**
- **Evacuation**
- **Alcohol**
- **Over dedication**

Figure 1

Range of emotional and behavioral responses to disaster.