

Textbook of Disaster Psychiatry

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Epidemiology of disaster mental health

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Introduction

Psychiatric epidemiology provides a broad foundation for general understanding of the mental health effects of extreme trauma and secondarily helps to inform the field of mental health response to less extreme stress. Disaster mental health has considerable relevance in today's world, with disasters and terrorism increasingly occupying concerns of communities internationally.

The study of the mental health effects of traumatic events suffers from inherent methodological limitations. Studies of personal traumatic events endemic to community settings (such as motor vehicle accidents, gunshot wounds, and violent assault) suffer from confounding resulting from the nonrandom nature of their occurrence.

Pre-existing characteristics of individuals may be associated with risk for exposure to traumatic events (Breslau *et al.*, 1998), such as drug abuse, other psychopathology, high novelty-seeking and low harm-avoidance characteristics of personality, and low socioeconomic status (Breslau *et al.*, 1991). Risk for exposure to traumatic events in community settings is thus confounded with the mental health consequences of them. Studies of trauma in community settings may therefore be unable to determine what part of post-trauma effects is due to the traumatic experience, and what is pre-existing in individuals predisposed to such exposure. Because pre-existing characteristics

of individuals exposed to trauma in individual incidents in communities determine their status after the event, findings from studies of other kinds of traumatic events may not apply to populations affected by disasters. Adding further layers of bias to research on psychological trauma, many studies sample from treatment populations (such as post-traumatic stress disorder (PTSD) clinics), where virtually all individuals studied have psychiatric illness.

Disaster studies have the potential to sidestep many of these problems. Disasters strike more random cross-sections of the population, or groups without special characteristics other than, for example, having shown up for work on the day of a workplace disaster. Therefore, disasters provide opportunities to study mental health effects of extreme trauma in the most pure form, generally unencumbered by biases of characteristics conferring vulnerability to traumatic events. A noteworthy exception to the "equal opportunity" style of selection in disasters, however, is Midwestern flooding, which preferentially affects lower socioeconomic status populations that are attracted to live on the inexpensive land on flood plains. Lower socioeconomic status is associated with elevated population base rates of psychiatric illness (Koppel & McGuffin, 1999; Rutter, 2003) and therefore this characteristic, more than the effects of the flood itself, may be a major source of mental health problems after the flood.

Despite the importance of disaster research in understanding general mental health effects of community-wide catastrophes, conducting this research is difficult. Obstacles to disaster research include lack of timely funding for rapid deployment of research initiatives, barriers to affected populations created by lack of appreciation for research and unsubstantiated concerns about effects on study samples, and difficulties initiating research in postdisaster settings where chaos is proportional to the scope and magnitude of the event.

The majority of available information on mental health effects of traumatic events has accumulated from studies of nondisaster trauma such as military combat (Brewin *et al.*, 2000) and individual traumatic experiences in communities (motor vehicle accidents, assaults, childhood sexual abuse). Experience from nondisaster events may not necessarily apply to postdisaster mental health work. Studies focused on disaster mental health are therefore critical to understanding post-traumatic mental health outcomes specific to disasters.

This chapter will provide an overview of epidemiologic research on the mental health effects of major disasters. It will begin by examining disaster typology and then proceed to examine various outcomes of disasters, and predictors such as pre-existing characteristics, exposure status, and time frame. The chapter will also critically review other predictors of potential relevance for postdisaster settings, and finally will synthesize from this information relevant implications for disaster intervention policy and practice.

Disaster typology

Characteristics of disaster agents may contribute to the occurrence and course of ensuing mental health problems. The generally accepted typology of disasters divides disaster agents into: (1) natural disasters, such as earthquakes, floods, tornados, and volcanoes – sometimes referred to as “acts of God”; (2) technological accidents, such as mass transportation accidents, structural collapses, and

Table 2.1 Disaster typology

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- Natural disasters
 - Technological accidents
 - Willful human-induced incidents
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explosions, involving human error rather than intent; and (3) willful human-induced incidents, including mass murders in workplaces and domestic or international terrorism (see Table 2.1). Of the various disaster types, natural disasters are thought to be associated with the mildest mental health consequences (Baum *et al.*, 1983), although this assertion is not uniformly accepted (Rubonis & Bickman, 1991). Technological accidents involving human error may generate greater psychopathology. Acts of terrorism with their willful human origins may be associated with the most severe mental health sequelae (Baum *et al.*, 1983; Beigel & Berren, 1985; Frederick, 1980; Gleser *et al.*, 1981; Norris *et al.*, 2002b; Shalev *et al.*, 2004).

Determining the relative severity of different types of disasters constitutes a challenge, because other characteristics of disasters that also affect outcomes, such as scope and magnitude of the event (reflected in numbers of fatalities and injuries, size of the geographic area involved, and amount of property destruction), terror (fear for one's life), horror (contact with the grotesque), duration, and repetition and recurrence, are inextricably tied to specific events. This thwarts dissection of disaster typology from the associated characteristics of individual disasters.

Untangling the effects of other characteristics of disasters from effects attributable to the type of disaster will require comparisons of mental health outcomes of many disasters of different types controlling for variation in other disaster agent characteristics. This task is further complicated by the lack of uniformity of study methods from one disaster study to the next, especially inconsistencies in outcomes measured, measurement tools, timing of assessment, and sampling strategies. For example, studies of the September 11 terrorist attacks differed in timing of data collection from days to

months later, and sampled groups with different exposure levels varying from being in the World Trade Center at the time the towers were attacked to random samples of the surrounding areas. The studies differed in instruments of measure and outcomes examined often deviating from critical elements of accepted diagnostic criteria. Inconsistency in research methodology among studies defies meaningful comparison of the estimates of post September 11 PTSD prevalence between populations in Manhattan and other parts of the country (Breslau, 2001).

Further complicating disaster typology, catastrophic events do not necessarily fall neatly into one category (World Health Organization, 1991). For example, a commercial airplane crash landing during a severe storm in Little Rock, Arkansas in 1999 was not just a technological accident, but it also involved elements of natural catastrophe, with the central role played by the weather in causing the accident. When the Mississippi and Missouri Rivers overflowed their banks in the Great Midwestern Floods of 1993, people blamed the Army Corps of Engineers for contributing to the catastrophe by its practices of containment and diversion of river water.

Catastrophes resulting from deliberate human acts can be subdivided into ordinary criminal acts such as mass murders, and terrorist acts. Terrorist acts are intended "...to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives" (U.S. Code of Federal Regulations, 28 C.F.R. Section 0.85). Terrorist acts most often involve conventional explosives in the form of bombings. Use of biological, chemical, and radiological agents (sometimes referred to as Weapons of Mass Destruction) in terrorist attacks is classified as bioterrorism.

The goals of terrorism are to create widespread fear and demoralization, disrupt society, and erode trust in government and authorities (Alexander & Klein, 2003). The intent is to affect far greater numbers of people than those in direct contact with the damaging agent and intimidate members of

Table 2.2 Characteristics of bioterrorism

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- Exposure not perceptible
 - Uncertainty about exposure
 - Misinterpretation of symptoms
 - Behavior directed by perception of exposure, not actual exposure
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communities or societies (Pfefferbaum *et al.*, 2002, 2005). Assessment of mental health effects and the scope of mental health interventions will therefore need to encompass a population far wider than the circumscribed number of individuals in direct contact with the disaster agent, and to measure mental health effects outside the confines of PTSD and other psychiatric disorders.

Bioterrorism has unique features not observed in conventional terrorism. In bioterrorism, exposure may not be perceptible (see Table 2.2). This characteristic has earned the term "stealth terrorism" (Lamberg, 2005). Damaging effects of bioterrorism may not be apparent immediately, declaring themselves only days, weeks or even years later. Facing uncertainty about exposure, people may be influenced by their own perceptions and contagion from rumors, speculation, and their own imaginations. People may misinterpret their own physiological fear responses as symptoms of biological exposures, seeking treatment in large numbers and overwhelming the health care system's ability to attend to patients with serious injuries and illness (Norwood *et al.*, 2001). Psychiatric responses to bioterrorism may become disarticulated from their level of exposure or injury. People's *perceptions* of their exposure, regardless of their *actual* exposures, may direct their behavior after bioterrorism.

Little research has been carried out on bioterrorist incidents, therefore studies of "mass hysteria," also known as "mass sociogenic illness," following actual or perceived exposures to biologic or toxic agents may be relevant to bioterrorism (Bartholomew & Wessely, 2002; Doyle *et al.*, 2004; Jones, 2000; Pastel, 2001). Psychological responses to toxic contamination accidents and natural epidemics such as severe acute respiratory syndrome

(SARS) may also be applicable to understanding mental health effects of bioterrorist incidents (Arata *et al.*, 2000; Bowler *et al.*, 1994a, 1994b; Lopez-Ibor *et al.*, 1985). Risk communication is a critical public health response from leadership to help the public react safely and appropriately (Covello *et al.*, 2001; Marks, 1993; Moscrop, 2001; National Research Council, 1999; Norwood *et al.*, 2001).

Mental health outcomes of disasters

A fundamental principle in contemplating mental health interventions after disasters is to fit the response to the population, its exposure, and the needs of the individual. Psychiatric sequelae may not only differ from one individual to the next, but also from disaster to disaster and population to population.

Post-traumatic stress disorder (PTSD) is the signature diagnosis of disaster, and mental health responses to disasters typically focus on it. Unlike most psychiatric diagnoses, PTSD incorporates an etiology in its definition. Diagnosis of PTSD requires "direct personal experience of an event that involves actual or threatened death or serious injury" (American Psychiatric Association, 1994) (p. 424). Additional potentially qualifying experiences for the diagnosis may include vicarious exposure through directly witnessing others in such an event and learning that a loved one was involved in such an event. Symptoms in three categories (intrusive re-experience, avoidance and numbing, and hyperarousal) are required for the diagnosis of PTSD once a qualifying exposure has been established.

Intrusion and hyperarousal are nearly universal experiences after intense exposure to a severe trauma. Among directly exposed survivors of the Oklahoma City bombing, 96% described at least one post-traumatic symptom (North *et al.*, 1999), and four out of five had the required number of symptoms in the intrusion and hyperarousal categories to diagnose PTSD. The most commonly reported symptoms were intrusive recollections (intrusion),

trouble concentrating (hyperarousal), sleep disturbance (hyperarousal), and jumpiness (hyperarousal). The avoidance and numbing symptom profile was less common, described by just one-third, and 94% of Oklahoma City bombing survivors who reported three or more avoidance/numbing symptoms (the minimum number required for diagnosis) met full criteria for PTSD, yielding a 94% specificity and 100% sensitivity for PTSD. The avoidance and numbing symptoms were further associated with problems functioning, treatment-seeking, psychiatric comorbidity, and drinking alcohol to cope. Intrusion and hyperarousal symptoms in the absence of avoidance and numbing were not associated with these variables. It appears, therefore, that intrusion and hyperarousal symptoms are common and themselves nonpathological, and that avoidance/numbing responses are the pathological part of PTSD (McMillen *et al.*, 2000).

One does not have to be directly exposed to a traumatic event to develop PTSD. Witnessing an event with exposure to grotesque and horrifying images may lead to PTSD. Additionally, exposure to a traumatic event only through learning that a loved one was in a traumatic event may also provide a sufficient stimulus for the development of PTSD.

Post-traumatic symptoms do not count toward a diagnosis of PTSD unless they are new after the event, interfere with functioning or are very disturbing, continue for at least one month, and are not better accounted for by another disorder. This is to differentiate from clinically nonsignificant responses, brief psychological upset experienced by most people after severely traumatic events, chronic symptoms unrelated to the event, and symptoms of other disorders from post-traumatic illness. Most measures of PTSD, however, do not take into account the individual's actual exposure to a traumatic event, specificity of symptoms for the event, effects of the symptoms on the person's life, duration of symptoms, or other potential medical explanations for the symptoms. These measures may inflate population estimates of PTSD and overdiagnose individual cases.

Table 2.3 Disaster psychiatric responses

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- PTSD
 - Major depression
 - Panic disorder
 - Phobic disorder
 - Substance use
 - Medically unexplained symptoms
 - Distress
 - Resilience
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For people who become symptomatic in the first two days after a traumatic event, before a diagnosis of PTSD can be established, the diagnosis of acute stress disorder may be applied. This diagnosis requires any PTSD symptom plus one or more dissociative symptoms. After four weeks, acute stress disorder is no longer a consideration, and the diagnosis is dropped, or else upgraded to PTSD if all the criteria for the diagnosis of PTSD are met.

The prevalence of PTSD described in association with disasters ranges widely. Only 2%–4% of survivors of natural disasters such as tornados (North *et al.*, 1989), mudslides (Canino *et al.*, 1990), and volcanoes (Shore *et al.*, 1986b) were found to develop PTSD. Post-traumatic stress disorder was reported in association with dioxin contamination among only 4%–8% of people exposed to it (Smith *et al.*, 1986). Other disaster studies have documented far higher rates of PTSD, including 44% associated with a dam break and flood (Green *et al.*, 1990), 53% following bushfires, 54% after an airplane crash landing (Sloan, 1988), and 50%–100% exposed to a plane crash into a shopping mall (Newman & Foreman, 1987).

Post-traumatic stress disorder is not the only important mental health consequence of disasters (see Table 2.3). Whether following individual traumatic events or disaster, PTSD more often than not presents with comorbidity, especially when it presents in mental health treatment settings (North *et al.*, 1994, 1999; Smith *et al.*, 1990). Therefore, once PTSD has been assessed, consideration of other disorders must follow, because other disorders are likely. Post-traumatic stress disorder cases with

diagnostic comorbidity tend to have the greatest severity and associated disability (North *et al.*, 1999).

After PTSD, major depression is typically the next most prevalent disorder in most populations directly exposed to disasters (David *et al.*, 1996; Green *et al.*, 1992; McFarlane & Papay, 1992; North *et al.*, 1994, 1999). Individuals with pre-existing major depression are likely to suffer from major depression after disasters (North *et al.*, 1989, 1994, 1999); therefore, disaster-exposed individuals with a history of depression may warrant surveillance for signs of depression. Bereavement following violent death is seen among close family and associates after disasters, and can be confused with major depression, but it is distinct.

Other anxiety disorders besides PTSD, especially panic disorder and phobic disorders, may also be found in disaster-exposed populations (David *et al.*, 1996; Green *et al.*, 1992; McFarlane & Papay, 1992), but are not as prevalent as PTSD or major depression after disasters (David *et al.*, 1996; North *et al.*, 1994, 1999, 2002b).

The prevalence of alcohol and drug use disorders in populations is likely to be reflected in the occurrence of such problems after disasters, especially in men. Nevertheless, substance abuse after disaster is commonly assumed to represent self-medication or efforts to cope with the traumatic event (Jacobsen *et al.*, 2001; Saxon *et al.*, 2001; Zatzick *et al.*, 2001). Because of the prevalence of substance disorders in the population, and especially in certain populations at risk for them, the postdisaster setting may represent an opportunity to identify cases and direct cases to treatment. After disasters, people with pre-existing substance abuse problems may be flushed out of their private dwellings into public settings such as shelters, where their substance abuse may be exposed. In populations studied after disasters, alcohol and drug use disorders identified are almost always pre-existing (David *et al.*, 1996; North *et al.*, 1994, 1999, 2002b).

A number of studies have described increased use of alcohol, tobacco, and other drugs after disasters (Joseph *et al.*, 1993; Marcus 2001; McFarlane 1998; Pfefferbaum & Dougherty, 2001; Sims & Sims, 1998;

Smith *et al.*, 1999; Vlahov *et al.*, 2002), although this is not a universal finding (Shimizu *et al.*, 2000). Most reported increases in substance use in disaster studies are observed in individuals with pre-existing substance abuse or other psychiatric difficulties (Joseph *et al.*, 1993; McFarlane, 1998; Pfefferbaum & Dougherty, 2001; Sims & Sims, 1998; Smith *et al.*, 1999; Vlahov *et al.*, 2002). Conversely, decreases in alcohol consumption were described following a major earthquake in Japan (Shimizu *et al.*, 2000). Studies reporting such findings have provided little relevant information to demonstrate negative effects of increased substance use on employment, family relations, social and recreational activities, and health and legal status. Individuals seeking out the camaraderie of friends in social settings that involve consuming moderately more alcohol and cigarettes for a circumscribed period after a community-wide catastrophe may not necessarily be demonstrating evidence of a problem requiring a clinical response or intervention.

Patterns of increased use of alcohol and other drugs must be differentiated from abuse/dependence diagnoses. Any small but statistically significant increases in use of substances after disasters may represent nonpathological and possibly temporary disaster-related alterations in consumption patterns, and/or problematic increases in use among individuals with established abuse or dependence, but reports of changes in use of substances after disasters apparently do not often translate into new alcohol or drug use disorders after the event (David *et al.*, 1996; North *et al.*, 1989, 1994, 1999, 2002b).

Somatization disorder, characterized by a life-long pattern of endorsing multiple medically unexplained complaints, is not a disorder that emerges after trauma (Breslau, 1998). A large disaster literature, however, has accumulated a repository of medically unexplained complaints, otherwise known as somatization, following traumatic events. Unfortunately, many instruments purporting to measure somatization cannot discern medically unexplained from medically based symptoms (Merskey, 1995; Ramsay *et al.*, 1993; Tennant *et al.*, 1986; Viel *et al.*, 1997), fail to distinguish clinically

significant somatic complaints from minor annoyances, and do not distinguish new symptoms after the disaster from pre-existing symptoms, thus artifactually elevating post-traumatic problems.

In general populations, some individuals report multiple medically unexplained somatic symptoms. Some, often the same, individuals may endorse an array of psychological symptoms without basis in established psychiatric disorders (Lenze *et al.*, 1999). In disaster-exposed populations, pre-existing symptom-reporting tendencies tend to persist afterward, with those reporting the most pre-existing symptoms also reporting more current symptoms. Tools designed to measure somatization may be insensitive to individual symptom-endorsement proclivities, further elevating estimates of post-traumatic problems (Wetzel *et al.*, 2000).

Somatization following disaster exposure was compared with that in unexposed comparison populations in two prospective studies. Following torrential rains and mudslides in Puerto Rico, somatization increased by a clinically small, but statistically significant, amount. The effect on somatization was considered nonspecific and potentially explained by known medical and psychiatric disorders or the unsanitary postdisaster conditions (Bravo *et al.*, 1990). A study of multiple disasters, including dioxin contamination, tornados, floods, and discovery of radioactive well water affecting one geographic area, found no new somatization symptoms and only one case of somatization disorder, occurring in the unexposed comparison group and predating the disaster (Robins *et al.*, 1986). The study concluded that somatization was not a product of the disasters and the affected population was resilient.

The resilience of populations affected by disasters is easily overlooked in the rush to identify psychiatric cases for mental health interventions. Most people do not become psychiatrically ill after disasters, even after exposure to the most catastrophic events (Galea *et al.*, 2002; North *et al.*, 1999; Schlenger *et al.*, 2002; Schuster *et al.*, 2001; Silver *et al.*, 2002). Fewer than one-half of people in the direct path of the blast of the Oklahoma City

bombing developed a psychiatric disorder (North *et al.*, 1999). Strong emotional reactions, described by the majority of people affected by severe disasters, are normative and can hardly be considered pathological in these settings. Such strong emotions have been described as "normal responses to abnormal events" and have been termed "subdiagnostic distress" (North & Pfefferbaum, 2002). After the Oklahoma City bombing, 96% of survivors acknowledged one or more post-traumatic symptoms. Emotional reactions occurring outside the context of PTSD consist largely of intrusion and arousal symptoms such as nightmares, insomnia, problems concentrating, and jumpiness without prominent avoidance and numbing (North *et al.*, 1999). These symptoms tend to diminish with the healing processes of time. Outside the context of psychiatric illness, it might be advisable to refer these reactions in nonpathologizing language such as "reactions" or "responses" rather than "symptoms" (North & Pfefferbaum, 2002).

Distinguishing distress from PTSD or other psychiatric illness is pivotal for application of post-disaster interventions appropriate to the needs of affected individuals and populations. For post-disaster mental health intervention, one size does not fit all. Available treatments for psychiatric disorders, including psychopharmacologic agents and psychotherapy, are effective and should be utilized. These measures may not be appropriate for subdiagnostic distress, for which support, education, and reassurance are more applicable interventions. Just as it is important to avoid pathologizing the distress of individuals affected by disasters, it is also important not to overlook postdisaster psychiatric illness. Post-traumatic stress disorder is a serious medical condition deserving treatment and is not considered a normal response to traumatic events.

Not all mental health outcomes after severe adversity are necessarily negative. Many people are challenged or stimulated to grow or develop in positive ways by cataclysmic life events (Frazier *et al.*, 1995; McMillen, 1999; McMillen *et al.*, 1997). After disasters, most people are able to identify something positive that came about as a result of

the experience, such as appreciation of life, or people treating one another better (McMillen, 1999; McMillen *et al.*, 1997). Failure to inquire into positive outcomes may overlook them altogether, in the process painting an especially pessimistic portrait and missing opportunities to appreciate and enhance these positive effects.

Considerations of space and time frames apply to the mental health effects of disasters. Mental health effects differ by physical proximity to a disaster agent as well as in different time frames.

It is intuitive that the degree of an individual's exposure to a disaster agent predisposes to likelihood of development of PTSD in association with it. Studies have demonstrated that those directly exposed to severe incidents are at highest risk for PTSD and other psychiatric sequelae (North *et al.*, 1999), and risk for mental health consequences generally decreases with increasing distance from the disaster agent and decreasing exposure of affected individuals (Shore *et al.*, 1989). The prevalence of PTSD in relation to the Mt. St. Helens volcano eruption was associated with proximity of the individual's home to the volcano (Shore *et al.*, 1986a, 1989). Severity of PTSD was found to decrease with greater distance from an earthquake's epicenter (Abdo *et al.*, 1997). Degree of injury among survivors of the Oklahoma City bombing predicted development of PTSD (North *et al.*, 1999). Even though exposure is required for a diagnosis of PTSD in individuals and is critical for considering mental health effects of disasters on populations, psychopathology should not be automatically assumed in individuals with intense exposure to a severely traumatic event.

In populations, exposure level is a fundamental determinant of the mental health effects of disasters (Abdo *et al.*, 1997; Baum *et al.*, 1983; Beigel & Berren, 1985; Frederick, 1980; Gleser *et al.*, 1981; North *et al.*, 1999; Rubonis & Bickman, 1991; Shore *et al.*, 1986a, 1989). Exposure level is a pivotal factor for conceptualizing different population groups after disasters. People may be indirectly exposed to a disaster's effects in a variety of ways, such as disruption of business, damage to the workplace,

financial loss, inconvenience of disrupted electricity and other utilities, and commuting delays caused by detours and damaged thoroughways or transportation systems. Indirectly exposed groups can be expected to show a lower prevalence of psychiatric problems after disasters compared to those directly exposed, and those less directly exposed who do develop postdisaster psychiatric disorders may have elevated rates of pre-existing psychiatric problems (Breslau & Davis, 1992).

The scope and magnitude of the 1995 Oklahoma City bombing and especially the September 11, 2001 attacks stimulated new thinking about the potential range of disaster mental health effects. People may potentially be affected in places remote to the disasters. With widespread economic consequences following immense disasters such as the September 11 attacks, significant mental health consequences may be anticipated in the population (Bland, 1998). At the farthest extremes of the ripple effects of disasters are people geographically distant, such as people in other parts of the country who may hear about the event indirectly such as through television news coverage.

After the Oklahoma City bombing, the surrounding communities were psychologically affected (Pfefferbaum *et al.*, 1999, 2000; Smith *et al.*, 1999; Sprang, 2001). After the September 11 attacks, psychiatric symptoms spread outward concentrically from Ground Zero in diminishing ripple patterns (Anonymous, 2002; Galea *et al.*, 2002, 2003). The psyche of the entire nation was said to be affected, with evidence of widespread emotional and attitudinal changes (Blanchard *et al.*, 2005; Ford *et al.*, 2003; Linley *et al.*, 2003; Schlenger *et al.*, 2002; Schuster *et al.*, 2001) as well as psychological vulnerability to disaster-related mental health problems (Baker, 2002). After the Oklahoma City bombing and the September 11 attacks, community and household surveys of the surrounding metropolitan areas and more distant populations reported prevalence rates of PTSD, probable PTSD, subthreshold PTSD, PTSD symptoms and symptom levels, symptoms "consistent with" PTSD, and post-traumatic stress disorder components (Galea *et al.*, 2002; Pfefferbaum

et al., 1999, 2000; Schlenger *et al.*, 2002; Schuster *et al.*, 2001).

Remotely affected populations lack sufficient exposure to the traumatic event for its members to be considered candidates for a diagnosis of PTSD in relation to the event (Abdo *et al.*, 1997). By definition, psychiatric effects will be qualitatively different among indirectly exposed and remotely affected groups compared to those of directly exposed groups, based on the dependence of mental health effects on the level of exposure. Members of populations without sufficient exposure to a qualifying traumatic event cannot be considered to be candidates for a diagnosis of PTSD due to the event. Measuring PTSD after disasters becomes problematic among members of large populations affected by disasters of national and international proportions, because most individuals in such populations do not meet trauma exposure criteria, and for them PTSD cannot be meaningfully assessed. Aggregate PTSD data reported from populations with mixed exposures, including large segments distant from the event, therefore become uninterpretable. Such data characterize a nonexistent amorphous average, describing no part of the population. Sampling in studies of large-scale disasters must measure effects in direct and indirect exposure groups independently from one another and from remotely affected populations, reporting findings separately to estimate the population burden of PTSD.

The significance of PTSD symptoms unassociated with an exposure to a qualifying traumatic event is uncertain. In this context, "symptoms" of a disorder that by definition cannot occur are paradoxical. PTSD "symptoms", in this case disembodied from a disorder that cannot occur suggests need for revision of terminology characterizing these experiences as nonpathological responses or reactions, rather than as "symptoms."

After the September 11 terrorist attacks, concerns arose that people might develop post-traumatic mental health problems with exposure only to graphic television images of the incident. Published reports claimed that contact with media coverage of disasters is associated with PTSD symptoms

(Ahern *et al.*, 2002; Associated Press, 2001; Pfefferbaum *et al.*, 1999, 2003; Schlenger *et al.*, 2002; Schuster *et al.*, 2001). Studies do not always take into account that the experience of observing disaster media coverage does not meet diagnostic criteria for exposure to a significant trauma, and that causal relationships are not necessarily in the anticipated direction between viewing television media coverage of an event and emotional responses to it.

Although the news of the September 11 attacks and the graphic images on television were upsetting to the public viewing the media reports, this stimulus is not in the same league as being directly exposed to the event, and by itself would not lead individuals to develop PTSD. To characterize the distress of viewing media coverage of a disaster as equivalent to an exposure precipitating PTSD unnecessarily pathologizes a population and trivializes the experience of groups with high-intensity exposure (North & Pfefferbaum, 2002). Such responses may represent the norm in such circumstances.

Rescue and recovery workers are a group that may have varying exposures to a disaster and also pre-existing characteristics that shape mental health outcomes. They may be exposed to grotesque and horrific experiences in the aftermath of disaster, and in some disasters, as in the September 11 attacks on the World Trade Center, they may personally encounter danger and sustain injuries, may experience bereavement for fallen colleagues, and they may know direct victims. These types of exposure may translate into different mental health effects. Additionally, self-selection and selection for this type of work, training, and experience in this work may lend resilience to this group (Cardeña, 1994; North *et al.*, 2002a). Among firefighters who served as rescue and recovery workers after the Oklahoma City bombing, PTSD was less prevalent compared to survivors of the bomb blast (North *et al.*, 2002b). The most prevalent disorder among the firefighters was alcohol abuse or dependence, diagnosed in one-quarter of the firefighters after the bombing; nearly all of these cases were pre-existing. A study of firefighters not involved in community-wide

catastrophes reported current alcohol abuse rates of 29% (Boxer & Wild, 1993), suggesting that these high rates of alcohol use disorders may be more a function of the population than a response to trauma work, which has often been assumed (Jacobsen *et al.*, 2001; Saxon *et al.*, 2001; Zatzick *et al.*, 2001).

Differences in potential mental health outcomes determined by exposure status dictate different assessment designs for studying disaster-affected populations by exposure level. For small, highly exposed samples exposed to a severe disaster, which may be expected to have high rates of psychopathology, full diagnostic assessment may be feasible. Larger, less exposed populations, however, may overwhelm potential resources because numbers to be assessed are larger and the expected yield of cases is smaller. Full diagnostic assessment may be too resource-intensive, and screening for high-risk cases may be more feasible (Norris *et al.*, 2002a). Psychiatric screening tools are appropriate and more economical for this task, to identify high-risk cases that warrant full psychiatric evaluation. Screening tools, however, should not be used for diagnosis, to determine treatment decisions, or to estimate population rates of disorders. Screening instruments often fail to assess all DSM-IV criteria for the diagnosis of PTSD, including establishing exposure to a traumatic event, differentiating new from predisaster symptoms, determining duration of symptoms, and demonstrating the clinical or functional significance of the symptoms. Individuals identified as high risk for PTSD using screening tools need follow-up with a full diagnostic assessment to direct treatment decisions and provide accurate estimations of population rates of psychopathology.

Taking into account the many methodological determinants of outcomes, including type and severity of disaster, level of exposure, the type of outcome measured, and instruments of measure, a wide range of outcomes in disaster studies is expected. Even within directly exposed populations, the proportion with PTSD appears to vary markedly from one disaster to the next, ranging from virtually

none (North, 2001; Shore *et al.*, 1986b) to essentially all of those exposed (Newman & Foreman, 1987). Among 182 randomly sampled directly exposed survivors of the Oklahoma City bombing, 87% of whom sustained injuries, one-third developed PTSD in association with it as measured by structured diagnostic interviews (North *et al.*, 1999). This can be considered to be a solid benchmark against which other highly disaster-exposed populations can be compared.

Varied mental health consequences may manifest in different postdisaster time frames. After disasters, post-traumatic stress begins quickly, most often within a day (North *et al.*, 1997, 1999). Delayed onset (defined as PTSD beginning six months or more after the event) is rarely observed in disaster survivors, unlike PTSD studied in the context of military combat (Helzer *et al.*, 1987; Prigerson *et al.*, 2001) or childhood abuse (McNally *et al.*, 2000). Occasionally PTSD begins early after a disaster but not quite enough symptoms are present to meet criteria for a diagnosis; later, an emergent symptom may nudge the symptom count over the diagnostic threshold. Such cases should not be mistaken for late-onset PTSD (North *et al.*, 1997), although longitudinal studies typically do not attend to this issue. People may delay in seeking treatment for PTSD after disasters, but this should not be assumed to represent delayed onset (North *et al.*, 1997; Weisaeth, 2001).

The longitudinal course of PTSD tends to be chronic (defined as lasting at least three months) after disasters as well as endemic in general populations (Breslau & Davis, 1992; Kessler *et al.*, 1995; North *et al.*, 1997, 1999). After the Oklahoma City bombing, no cases had recovered by three months (North *et al.*, 2004), and a year later most people with PTSD remained symptomatic (North *et al.*, 2004). A year after a mass murder episode, approximately one-half of PTSD cases had fully recovered (North *et al.*, 1994). Few predictors of recovery from PTSD have been identified (North *et al.*, 1994, 2004).

Post-traumatic symptoms not rising to the level of PTSD are more likely than symptoms of full PTSD to diminish within weeks to months after the

event (Galea *et al.*, 2003; Silver *et al.*, 2002). The difference in the time course of symptoms among those with and without PTSD validates an important conceptual difference between symptoms and post-traumatic illness.

Predictors of disaster outcomes

Predicting mental health outcomes of disasters is vital to directing mental health resources that may be scarce in postdisaster settings. Because only some people develop psychiatric disorders, being able to identify the high-risk cases early through effective screening can conserve resources (see Table 2.4). Although prominent avoidance and numbing responses may be a marker for PTSD (McMillen *et al.*, 2000; North *et al.*, 1999) and the onset of PTSD symptoms is known to occur early after disasters, it is not known whether these symptoms are part of the early response or whether they appear later. Prospective study of the timing of onset of specific symptoms is needed to determine how early avoidance and numbing symptoms begin. If they are part of the early symptom response, then avoidance and numbing symptoms may be useful in early identification of people at high risk for PTSD. Regardless, prominent avoidance and numbing symptoms at any time after a disaster signal risk for PTSD not conveyed by intrusion or arousal symptoms alone.

Although the severity of disaster agents and degree of individual or population exposure to the disaster are considered predictors of PTSD (Abdo *et al.*, 1997; Green, 1993; North *et al.*, 1999; Shore *et al.*, 1986a; Shore *et al.*, 1989), disaster severity and exposure are not among the strongest predictors of outcomes (Sungur & Kaya, 2001). Gender is a strong predictor of post-traumatic anxiety and depressive disorders. In the general population, women exhibit twice the prevalence of PTSD, other anxiety disorders, and major depression as men (Blazer *et al.*, 1991; Breslau, 2002; Eaton *et al.*, 1991; Fullerton *et al.*, 2001; Helzer *et al.*, 1987; Kessler *et al.*, 1995; Pincinelli & Wilkinson, 2000; Weissman

Table 2.4 Predictors of disaster outcomes

-
- Gender
 - Pre-existing psychopathology
 - Age
 - Education
 - Socioeconomic status
 - Postdisaster adverse life events
-

et al., 1991), while men are more prone to substance use disorders (Anthony & Helzer, 1991; Brady & Randall, 1999; Bucholz, 1999; Helzer *et al.*, 1991). After disasters, gender is also a robust predictor of PTSD and major depression (Kasl *et al.*, 1981; Lopez-Ibor *et al.*, 1985; Moore & Friedsam, 1959; Rubonis & Bickman, 1991; Steinglass & Gerrity, 1990; Weisaeth, 1985).

A second robust predictor of disaster mental health outcomes in individuals is pre-existing psychopathology (Bromet *et al.*, 1982; Chen *et al.*, 2001; Feinstein & Dolan, 1991; Hocking, 1970; Liao *et al.*, 2002; Maes *et al.*, 2001; McFarlane, 1989; North *et al.*, 1989, 1994, 1999; Ramsay, 1990; Smith *et al.*, 1990; Southwick *et al.*, 1993; Steinglass *et al.*, 1988; Weisaeth, 1985). Pre-existing psychiatric illness, however, is neither necessary nor sufficient to generate PTSD after disasters. Post-traumatic stress disorder may occur in people with no prior psychiatric difficulties; conversely, many people with previous psychiatric illness remain free from psychopathology after disasters (North *et al.*, 1994, 1999; Smith *et al.*, 1990). With exposure to mild events or with minimal exposure to more severe events, previous psychiatric history is an especially strong predictor of PTSD (Breslau & Davis, 1992; Feinstein & Dolan, 1991; Hocking, 1970; Shore *et al.*, 1986b; Smith *et al.*, 1993). With increasing exposure and greater severity of the traumatic event, previous psychiatric history is less predictive, and greater numbers of those with no prior psychiatric history develop PTSD (Hocking, 1970).

Few studies of predisposing psychopathology have examined the predictive potential of personality. Limited research suggests that pre-existing personality disorders predict postdisaster mental

health problems (Chen *et al.*, 2001; Liao *et al.*, 2002; Maes *et al.*, 2001; McFarlane, 1989; Roy, 1982; Southwick *et al.*, 1993). A difficulty in conducting this research is differentiating the temporary effects of extreme events on people's patterns of interacting with others and the world from pre-existing personality disorders. This differentiation is addressed by documenting a lifelong pattern of maladaptive behaviors with early origins well before the disaster.

Other, less consistent predictors of PTSD and other psychopathology after disasters include age, education, and socioeconomic status. Apparent associations of some of these variables with psychopathology may lie with their confounding with significantly associated variables. For example, in two studies, lack of education was associated with PTSD only because it was a characteristic of women, who had a significantly higher incidence of PTSD than men (North *et al.*, 1994, 1999).

A well-known predictor of postdisaster mental health problems is the occurrence of other adverse life events in the postdisaster period, including events directly related to the disaster as well as indirectly associated and unrelated events such as being assaulted or loss of an elderly parent to natural causes (Epstein *et al.*, 1998; Maes *et al.*, 2001; North *et al.*, 1999). Disasters intrude into people's lives in the context of their existing situations and problems, and these existing issues are likely to continue to be a powerful predictor of outcomes in disaster settings.

Although social support has been linked to positive mental health outcomes (Bland *et al.*, 1997; Regehr *et al.*, 2001), especially among men (Solomon *et al.*, 1987), causal directionalities are uncertain, and likely to be complex. Social support may be as much a function of an individual's psychosocial strength as a determiner of mental health, because well-adjusted people tend to develop healthy social support networks. The same might be said about uncertainty of causal directionalities in coping as a predictor of mental health outcomes. Ineffective coping strategies, especially avoidant or passive coping rather than active problem-solving

strategies (Arata *et al.*, 2000; Gibbs, 1989; North, 1995; North *et al.*, 1994, 2001), predict adverse mental health outcomes. Even though these associations have been demonstrated prospectively, it could be argued that while ineffective coping styles may increase vulnerability to psychiatric problems, those psychiatric problems may impair the individual's ability to cope.

Community response to disaster may affect mental health problems that may be reduced by an outpouring of community support (North *et al.*, 1989) or raised in settings of community conflict (Johnes, 2000). The postdisaster adjustment of rescue workers, whose mission is to serve the community, may be especially influenced by community response (Green & Lindsay, 1994; Hassling, 2000).

Implications

From the information reviewed in this chapter, practical recommendations can be made for post-disaster intervention policy and practice.

Interventions are needed early after disasters, and the need can be expected to continue through the long term

Based on available research, the acute onset and chronicity of post-traumatic disorders are now well known. Even though psychiatric illness may not be diagnosable for weeks after disasters, the evidence indicates it starts right away, and that considerable chronicity can be expected. After disasters, especially large-scale incidents, when psychopathology and anguish are acute, mental health professionals are moved to want to help. These sentiments sometimes bring so much help in the first few hours and days that the response overwhelms the situation.

In later weeks and months, however, as psychiatric disorders solidify in the affected population, signaling a larger need for formal mental health services, attention to the plight of the exposed population fades. The mental health professionals

have returned to their offices and their mental health practices. At this point, mental health resources may be difficult to access by those in need. Mental health professionals are encouraged to save their benevolent urges to help for the long-term needs that are almost certain to manifest later. Even though delayed PTSD is not a generally observed phenomenon after disasters, people may delay in seeking mental health assistance, and many may obtain no help at all (Weisaeth, 2001). Outreach to members of the affected population who may be reluctant to venture outside its usual support network to accept help from strangers may therefore be needed (Lindy *et al.*, 1981; North & Hong, 2000).

Postdisaster populations can be most effectively approached by considering levels of exposure and pre-existing characteristics

Mental health interventions have traditionally focused on the most directly and highly exposed subsets of populations. The far-reaching effects of the September 11 terrorist attacks have necessitated reconsideration of the scope of attention for mental health sequelae. Not all subsets of populations, however, have the same sets of mental health issues and needs. Because groups diverge in post-disaster characteristics according to their level of exposure and pre-existing characteristics that shape outcomes, different approaches are needed to utilize limited mental health resources in post-disaster settings. Large surrounding populations with minimal direct exposure must be screened for the minority who will be at risk for clinically significant mental health problems, while full-scale systematic psychiatric evaluation may be feasible with available resources for responding to mental health outcomes of small, highly exposed groups who are expected to have the highest risk for mental health problems.

Although exposure level has utility for predicting psychopathology in groups or populations, it can be misleading if applied to individuals as an

indicator of psychiatric illness. Research suggests that prominent avoidance and numbing responses may indicate high risk for PTSD (McMillen *et al.*, 2000; North *et al.*, 1999, 2002b). A screening tool with demonstrated high sensitivity and specificity is based almost entirely upon assessment of these symptoms (Breslau *et al.*, 1999). Screening instruments do not provide psychiatric diagnoses or a confident basis for determining population rates of psychiatric disorders, however. Psychiatric disorders in individuals must not be assumed based on exposure level or on screening instruments, but must be individually determined according to application of diagnostic criteria.

Differentiating psychiatric illness from distress facilitates treatment of psychiatric disorders without discounting or unnecessarily pathologizing distress

The first task in responding to mental health effects following disasters is to differentiate psychiatric illness from distress, because these two entities generally require different approaches and interventions tailored to their needs (National Academy of Sciences Institute of Medicine, 2003). Most people without psychiatric illness find talking about their traumatic experiences with trusted others to be helpful (North *et al.*, 1999; Smith *et al.*, 1990). Interventions designed to increase social support and sharing may be beneficial for many. Distress that does not merit a psychiatric diagnosis should not be discounted, because appropriately directed interventions may provide benefit for reactions not constituting illness.

People with prominent avoidance and numbing profiles that are central to PTSD may be unable to tolerate the level of exposure to reminders of the disaster required by interventions that force them to come face to face with reminders, which may be retraumatizing for them. Post-traumatic stress disorder and other disorders need psychiatric evaluation and treatment, because effective treatments are available. Special attention should be paid to: individuals with intense exposure to severe

disasters, those experiencing additional adverse life events, female gender, those with pre-existing psychopathology, and those with prominent avoidance and numbing symptoms, who are at greatest risk for PTSD. Assessment should not stop with PTSD, because comorbid disorders are usually present, and may be at least as important to the course of recovery and the choice of treatment as the PTSD.

Summary

This chapter has provided an overview of epidemiologic research on mental health effects of major disasters, beginning with disaster typology and proceeding to examine various mental health outcomes and predictors of them. Practical recommendations for mental health policy and practice in disaster settings have been distilled from relevant empirical data from disaster research.

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