Chapter 8
Psychosocial Responses to Disaster and Exposures: Distress Reactions, Health Risk Behavior, and Mental Disorders

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Abstract Disaster events cause a range of mental and physical health effects. Nuclear exposures result in unique psychological responses by affected individuals and communities. Planning, preparation, response, and recovery are enhanced by a focus on population health management, integration of relevant community and cultural variables, and effective use of risk communication.

Keywords Disaster • Nuclear • Mental health

8.1 Introduction

Mental health is an essential aspect of healthcare, including disaster response, and a substantial part of the global challenge of healthcare [1]. Although most people will show resilience in the face of disasters, these and other types of extreme events also result in distress reactions, health risk behaviors, and mental disorders (see Fig. 8.1), collectively termed "psychosocial" responses for the purposes of this chapter. These events affect a wide range of individuals, including direct victims and their families, surrounding community members, and first responders [2]. Disasters that result from intentional acts or technological failures ("human-made

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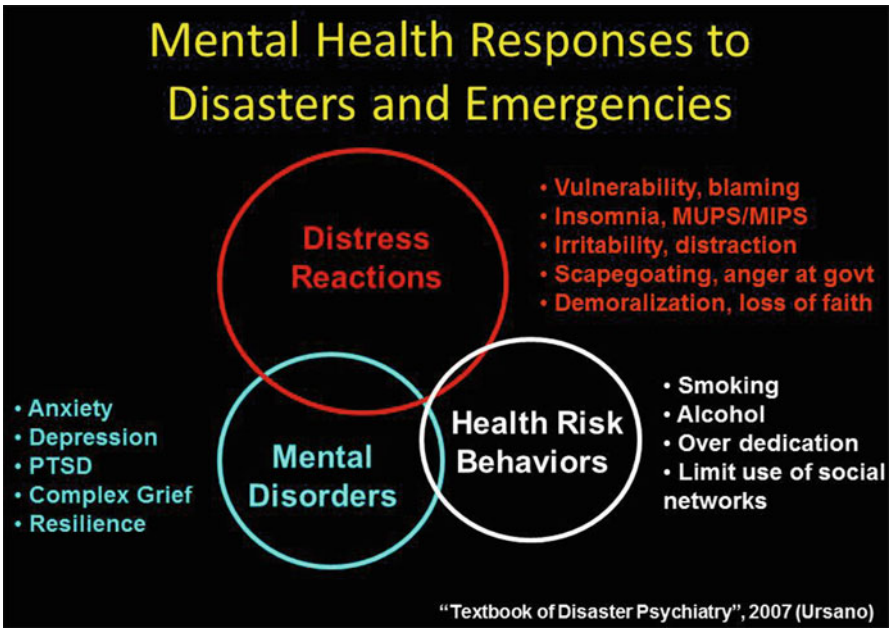

Fig. 8.1 Mental health responses to disasters and emergencies

disasters"), such as a nuclear exposure, often produce the most severe psychological symptoms [3]. Community planning, training and education for responders, and credible and timely communication from leaders and trusted authorities are important aspects of managing psychosocial response to nuclear exposures.

Knowledge of psychosocial responses to disaster comes from extensive observation of community behaviors following natural and man-made disasters [4]. In addition, there is evidence from recent and historical nuclear accidents and the field of bioterrorism that enhance our understanding of how individuals and communities specifically respond to fears of exposure to chemical, biological, radiological, and nuclear material [5, 6]. Patterns of psychosocial response are influenced by community and cultural characteristics. The response of community leaders and technical experts to a disaster can influence the distress and behaviors of disaster communities, both positively and negatively.

Nuclear accidents have two characteristics that are of importance to understanding their unique psychosocial response. First, these incidents are heavily influenced by human factors. Second, nuclear accidents involve uncertain exposure to hazards not well understood by the general population. Very few people understand the risks posed by nuclear material and contamination. Usually anything nuclear or associated with radiation is seen as an ominous threat that generates responses out of proportion to actual danger. Credible and accurate risk communication is essential to disaster recovery. Community responses to past nuclear exposures, including World War II, Three Mile Island, Chernobyl, and Fukushima, demonstrate that psychosocial consequences were greater than the actual illnesses and injuries

directly attributed to radiation or contamination. Understanding community response to nuclear accidents offers valuable information to assist governments, community leaders, and healthcare personnel.

8.2 Psychosocial Responses to Disasters

8.2.1 Distress Reactions, Health Risk Behaviors, and Mental Disorders

In the immediate aftermath of a disaster, distress reactions predominate. Individuals feel a sense of vulnerability and often engage in blaming, scapegoating, and expressions of anger at government and other leaders perceived as responsible. Demoralization and a loss of faith may also occur. Many individuals experience insomnia, irritability, and feelings of distractibility [7]. Some individuals present to healthcare settings with physical symptoms as a manifestation of psychological distress [8]. Symptoms such as headache, dizziness, nausea, fatigue, and weakness are common in the wake of a disaster even when an identifiable physical disorder cannot be found [9]. These are normal reactions to an extraordinary event. Planning for these distress reactions requires ensuring adequate resources to respond to individuals with distress symptoms in a timely and supportive manner and triage at emergency care settings to enable management of other physical and mental disorders.

In addition to distress responses, several health risk behaviors are known to increase following disasters. Increased use of alcohol, caffeine, and tobacco are common coping mechanisms and often represent self-medicating of distress symptoms [10]. Reduced use of social activities and self-imposed travel restrictions occur as well and may result in decreased access to social support networks and adverse economic impacts on the larger community [11]. Following disasters, intimate partner violence and overall levels of violence may increase as family distress and community concern about resources are increased [12].

Some individuals develop mental disorders following a disaster. The most widely studied of these disorders (but not the only one) is posttraumatic stress disorder (PTSD) [13]. Many studies suggest that approximately 10–20 % of those exposed to a traumatic event will develop PTSD, though many more individuals will experience milder symptoms, which can persist and become problematic over time [14]. The course of PTSD varies with some individuals recovering and some showing symptoms long after the initial incident (See Fig. 8.2). Posttraumatic stress disorder is not the only trauma-related disorder nor perhaps the most common [15]. People exposed to disaster are at increased risk for depression [16], generalized anxiety disorder, panic disorder, and increased substance use [17]. In some studies, suicide rates have also been shown to increase although this is not universal [18].

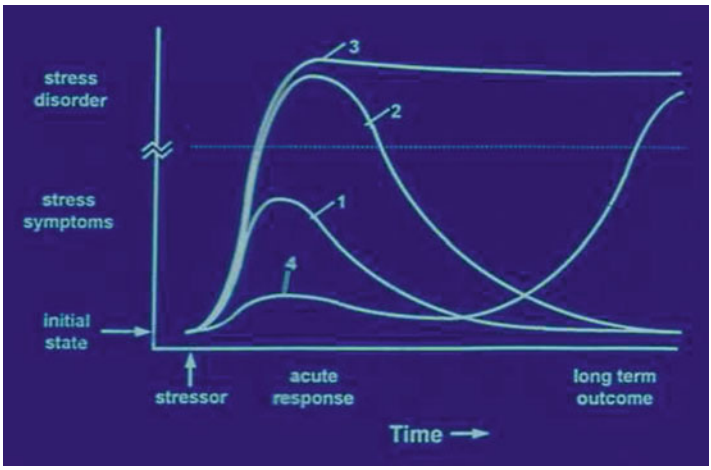

Fig. 8.2 Traumatic stress responses over time. Line 1 represents acute stress symptoms that resolve with time; 2 depicts ASD that also resolves; 3 is ASD that progresses to PTSD; and 4 shows delayed onset PTSD

8.2.2 Unique Aspects of Nuclear Exposures

Nuclear incidents can affect very large numbers of individuals and involve technological failures or be the result of man-made errors leading to exposures. They result in unique psychosocial responses related to the uncertainty of an invisible and mysterious chemical agent along with fears of permanent contamination (See Table 8.1). The inability to see and touch radiation and its depiction in books, movies, and other popular media as a frightening and inescapable force cause nuclear spills to produce adverse psychosocial responses that significantly exceed the actual health risks [6]. While many people have preconceptions about the impact of nuclear material, information and education are important aspects of population health management. In the aftermath of nuclear exposure, open and honest communication from government officials and leaders involved in managing the incident is critical in building trust and alleviating psychological distress [19].

World War II introduced the world to the extraordinary psychosocial effects of large-scale nuclear exposure that resulted from the use of atom bombs during war. Atomic bomb survivors in Japan experienced a chronic fear of long-term contamination, increased worry about their physical well-being, and an ongoing sense of harm and bodily deterioration despite extensive education about the science and medical impact of nuclear exposure [20]. Many years after the incident, these

Table 8.1 Unique psychosocial responses to nuclear exposure

Contamination fears
Chronic focus on bodily symptoms
Poor perception of self health
Long-term distress and worry
Mistrust in authority

individuals continue to attribute new physical symptoms to nuclear exposure despite medical reassurance these symptoms were unrelated.

In more recent history, accidents at Three Mile Island, Chernobyl, and Fukushima have further demonstrated the widespread and long-lasting psychosocial effects that occur in the aftermath of a nuclear exposure. The accident at Three Mile Island was a partial nuclear meltdown that occurred in 1979 in one of the two Three Mile Island nuclear reactors in the United States. It was the worst accident in US commercial nuclear power plant history. Nearly 1 year later, incident responders had elevated levels of distress [21]. Following the restart of the reactor 6 years after the incident, local residents reported increased anxiety and worry, specifically due to fear of cancer and loss of trust in the authorities [22]. For nearly 10 years post-incident, Three Mile Island residents were found to have increased levels of distress and persistent elevation in blood pressure when compared to similar people who were living at greater distance from the incident [23].

Chernobyl, the site of a nuclear power plant explosion in 1986, was the most disastrous nuclear accident until the incident at Fukushima in 2011. The Chernobyl incident resulted in feelings of helplessness regarding long-term health as well as decreased fertility rates, the latter suggesting a more negative future outlook on life [19]. Research also revealed high levels of general psychological distress and persistent focus on physical symptoms, not unlike the experience of World War II survivors documented by Lifton [24]. Nearly a quarter century after the events at Chernobyl, those who served as first responders, cleanup workers, and mothers who had small children at the time of the incident continue to experience elevated levels of depression, anxiety, and posttraumatic stress and report themselves as having poor health [25]. The lack of trust held by citizens in government and authorities appears to have played a major role in the development of long-term health effects following Chernobyl, demonstrating the importance of the relationships between government and citizens in affecting population health [26].

The disaster at Fukushima in 2011 was a unique hybrid event that included a tsunami, earthquake, and subsequent nuclear exposure. In addition to an increase in depression, anxiety, and PTSD, increased rates of delirium and psychosis were reported in the early aftermath of the disaster, most notably in those who were displaced from their home [27]. In the 7 months following the event, suicide rates were reported as increased among females in disaster-stricken areas [28]. Similar to other historical nuclear disasters, increased anxiety and distress were associated with fears of exposure and contamination, suggesting the need for education of both citizens, and relief workers remain as critical aspects of managing a nuclear exposure [29].

Because of the unique psychological and medical challenges that result from a nuclear exposure, advance planning for these types of catastrophic events is important to aid governments, responders, and victims [30]. Effective planning and preparedness may represent our best hope for reducing adverse psychosocial consequences.

8.3 Psychosocial Stages of Disaster Response

Governments and organizations that plan for and respond to disaster events need an understanding of the emotional and behavioral responses to disaster events. Often, there are phases to this response (See Fig. 8.3). Individuals or communities do not progress through these phases at exactly the same time or the same order. However, an understanding of the psychosocial factors that predominate in each phase (See Table 8.2) is helpful for policy development, response planning, and the training and education of personnel that deliver services to disaster victims [3, 31].

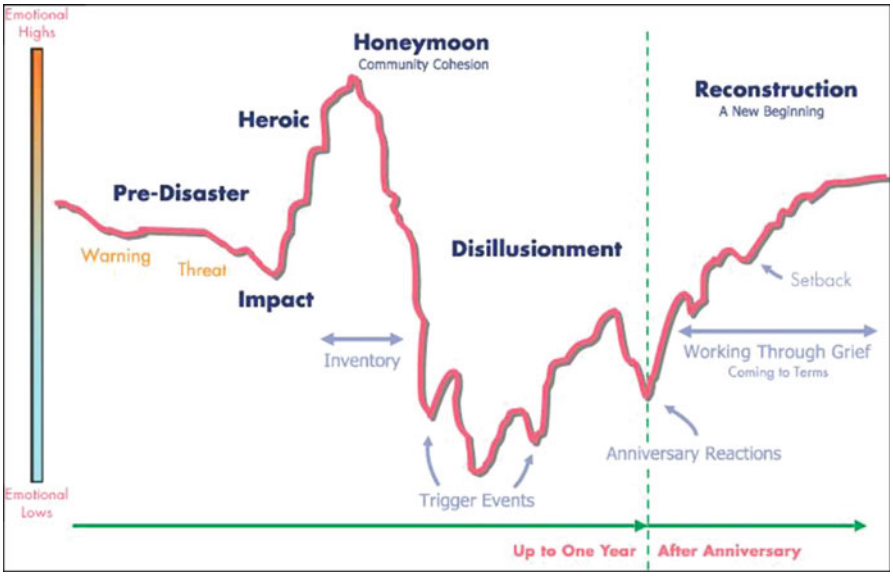

Fig. 8.3 Phases of a disaster

Table 8.2 Psychological and behavioral symptoms during disaster phases

Pre-disaster	Vulnerability, worry, remorse
Impact	Fear, confusion, numbness, disbelief
Heroic	Flashbacks, hyperarousal, anger, irritability, physical symptoms
Honeymoon	Collaboration, hope, optimism, openness to mental healthcare
Disillusionment	Disappointment, resentment, fatigue
Reconstruction	Acceptance, finding meaning, posttraumatic growth

8.3.1 Phases of a Disaster

A *pre-disaster* phase begins when an event is anticipated or advanced warning is given. This phase is highlighted by feelings of vulnerability and worry about safety. Individuals who do not heed advanced warnings to take recommended actions, such as sheltering in place or evacuation, may also experience significant remorse and feelings of responsibility for subsequent injury to loved ones or damage to property.

The *impact* phase occurs immediately after an acute event and consists of strong emotions, including feelings of disbelief, numbness, fear, and confusion. During this time, if the scope of a disaster broadens, the psychological effects typically increase. The *impact* phase may be brief, such as an earthquake. It can also be very long as in a slow-rising flood or an undetected radiological leak. Duration will affect both the response and the impact. In addition, the response of a population is affected by the culture and history of communities. Incorporating cultural understanding of communities and their values, leadership, and support systems is an important element of effective planning and response efforts.

Next is the *heroic* phase. This phase often lasts days to weeks in situations involving a short event period, but may be extended in disasters that occur over a longer period of time. Injury of loved ones or separation of family members can increase anxiety and worry and decrease the energy available for immediate problem solving. This phase is frequently accompanied by the initial appearance of assistance from outside communities, government agencies, or other countries. Disaster victims begin to adapt to the new environment and outsiders appear in the disaster community. Convergence begins during this phase, as people come into the disaster zone looking for family, friends, and even pets from which they have been separated. There is also a gathering of displaced individuals who have fled their homes. Intrusive symptoms (distressing recollections of explosions, fire, building collapse, and others, in the form of flashbacks or nightmares) emerge during this phase. Hyperarousal is also common, where individuals constantly feel tense and irritable. Physical symptoms, such as fatigue, dizziness, headaches, and nausea, along with anger, irritability, and social withdrawal, may also emerge. During this phase, personnel providing mental health interventions recognize the normal range of emotions and behaviors and respond to disaster victims with empathy, caring, and support for basic elements of living.

The *honeymoon* phase often follows. This coincides with more extensive availability of government and volunteer assistance and community bonding as a result of sharing the catastrophic experience as well as the giving and receiving of assistance. Survivors are often more hopeful during this phase and experience an optimism that the help they will receive will make them whole again and restore their lives to "normal." Governments can use this time to build positive relationships with affected communities by ensuring basic needs are met for food, water, and shelter and that resources are distributed equitably. In addition, clear and effective communication about what type of aid will be provided assists with setting expectations and helping reduce uncertainty. Providing disaster response workers

with items necessary to live and work safely and effectively can reduce the diversion of resources intended for victims. Disaster workers who are specifically aiding with psychosocial issues are most likely to be perceived as helpful during this phase, be readily accepted by community members, and develop a foundation from which to provide assistance in the difficult phases ahead.

Commonly, a *disillusionment* phase follows this honeymoon. Disillusionment is marked by feelings of disappointment and resentment, as disaster assistance agencies and volunteer groups begin to withdraw from the community. The magnitude of individual and collective loss may be realized. Hopes for aid and restoration of the pre-disaster emotional and physical environment may not be fully met. Individual and community economic losses may add to an already stressed population. The sense of community is weakened as individuals focus on their personal needs or the extent to which these needs are still unmet. Resentment may surface as survivors receive unequal compensation for what they perceive to be equal or similar damage and issues of social justice emerge. In addition, neighboring communities less impacted by the disaster often return to life as usual, which can discourage and alienate those who were more severely impacted. During this phase, survivors may become physically exhausted due to the enormity of multiple demands, including financial pressures, family discord, bureaucratic hassles, and a lack of free time for recreation or self care. Long-term displacement and loss of familiar home and surroundings can be a particularly challenging stressor. Health problems and exacerbation of preexisting conditions emerge due to ongoing stress and fatigue. Governments can anticipate difficulties as disaster assistance begins to diminish and provide survivors with anticipatory guidance in advance. Unity among formal and informal community leaders in anticipating and communicating upcoming changes or transitions is helpful. The disaster "anniversary" experience may occur during this phase and can be a critical opportunity for leaders to support disaster victims. This can be done through memorializing and creating meaning from the devastating events that have occurred. Failure to effectively address a disaster anniversary experience can further demoralize survivors, enhance feelings of frustration, and exacerbate underlying psychosocial distress.

The final phase often seen is that of *reconstruction* which may last for years. Survivors attempt to rebuild their lives and social and occupational identities by returning to old jobs or finding new work. They will also rebuild homes and resume or establish new social ties and emotional support systems. For some survivors, this phase is marked by an acceptance of new circumstances, including the changes and losses that have occurred. Individuals who are able to find meaning may experience posttraumatic growth, ultimately emerging from the disaster event with an increased sense of personal strength.

Individuals may progress through these phases at variable rates. Persons involved in planning and delivering care to victims of disasters may observe that individuals show emotional symptoms over different timelines in response to the same event. Moreover, depending on the severity of the trauma, available resources, coping skills, as well as subsequent disasters or other types of setbacks, individuals may develop persistent symptoms requiring prolonged treatment. Anger

may be directed at caregivers and community leaders if these important factors are not sufficiently accounted for in medical and psychosocial response plans.

8.4 Managing Individuals and Populations Concerned About Nuclear Exposure

Because of the unique nature of a nuclear exposure, it is important for healthcare personnel to understand how radiation impacts the human body, basic facets of triage, early medical interventions, and the psychosocial aspects of how individuals respond to nuclear events.

8.4.1 Medical Aspects of Nuclear Exposure

A nuclear event can result in external as well as internal exposure to radioactive material. Material on clothing can be removed by undressing or showering with water. Radioactive material that has entered the body is much harder to remove [32]. Unlike chemical and biological exposure, a radiation event is not immediately life-threatening unless there are other injuries (such as trauma or burns) or the dose received is in a range that is always fatal [33]. In most situations, a person injured or contaminated by radiation poses no significant risk to healthcare personnel. An exception would be if a radiation source was planted and concealed on a patient and the treatment provider has sufficient contact to receive a large dose [32].

Early radiation signs and symptoms can be nonspecific and often resemble those of a viral illness, usually starting within 72 h of an acute exposure. These signs and symptoms include fever, headache, nausea, vomiting, diarrhea, abdominal pain, loss of appetite, fatigue, weakness, rapid heart rate, swelling of glands in the face, and reddening of the skin. Many of these are nonspecific and resemble those accompanying common viral illnesses. As a result, small-scale or unknown radiation exposures often result in patients being misdiagnosed with a viral illness or other self-limiting illness [32, 33]. In a large-scale nuclear incident, healthcare personnel should maintain a much lower threshold for initiating a full evaluation for possible radiation injury. In addition, some of the signs and symptoms of early radiation exposure may be confused with those that accompany distress reactions and mental disorders.

All radiation exposure is thought to increase the lifetime risk of cancer with no set point at which cancer begins. This "linear, no threshold" theory drives the occupational exposure standard of keeping radiation exposure "as low as reasonably achievable" (or ALARA). Whether "linear, no threshold" is valid is the subject of much debate. Some areas of the world have very high background radiation levels with no increase in the cancer incidence [32].

8.4.2 Assessment of Those Presenting with Concerns for Nuclear Exposure

Individuals typically experience varying levels of radiation exposure and at different periods of time after a nuclear incident. Some will have received no exposure. Others may have received a dose of radiation that is only associated with late effects such as cancer risk or cataract development. If there has been a high-dose exposure, acute illness or death can follow after only a few days to weeks. These individuals may also have adverse psychosocial responses in addition to signs and symptoms of radiation exposure [3].

Triage of large groups of people may be necessary [34]. This starts with broadly delivered, repeated, and updated public health messages from a trusted and credible source or officials about who should seek care. The objective is to categorize exposure or contamination risk so that individuals can take appropriate action. The message should state the geographic boundaries within which individuals could be at risk of radiation injury. Individuals beyond such boundaries can be informed to avoid seeking medical attention for radiation concerns alone, unless other medical emergencies occur. Those contaminated or very close to the event will need a medical assessment of radiation dose received, since early treatment of radiation injury enhances long-term survival unless the dose was very high [33]. When thorough evaluation reveals no evidence of exposure, individuals should be promptly informed of this fact to help decrease worry and anxiety [35].

Competent and confident medical response, triage, and assessment will likely decrease the incidence and severity of adverse psychosocial effects [29]. When individuals express concerns about radiation exposure, it is important to assure them that their concerns are being taken seriously. When people do not feel their concerns are being taken seriously, they may exaggerate symptoms or return frequently for evaluations, placing increased demands on already limited healthcare resources.

8.4.3 Factors Affecting Presentations for Medical Treatment

For unknown exposures, clinical symptoms, including distress and worry, will drive presentations for care, either within the initial phase of illness (first 72 h) or after effects of radiation have manifested as an illness. If there are few cases, or if the cases present at different times to different facilities, determining the cause of the illness may prove difficult.

For known exposures involving relatively few people, medical evaluation may be within the capacity of many community hospitals. However, for a larger-scale nuclear exposure, the number seeking care may be large, and the health issues more complicated. When nuclear exposure is accompanied by explosion or fire, victims may seek care for life-threatening trauma or burns. In a densely populated area,

potentially thousands of people may need triage. Life-threatening non-radiation injuries should be addressed first. When radiation injury alone becomes acutely life-threatening, the dose will have been too high to allow survival, even with intensive treatment [33].

8.4.4 Common Psychosocial Responses Following Exposure

Large-scale nuclear exposure events result in a range of psychosocial responses that are similar to other disasters [36] including somatic concerns and belief that they are contaminated or exposed even when little data may support the concern. Although many people will be resilient, some will experience a range of transient and mild stress reactions. Some victims of nuclear exposure will experience more long-term and disabling psychological symptoms [37, 38]. The reestablishment of societal order and organization with the passage of time may help; and early focus on normal and adaptive functioning may speed recovery.

Emotional symptoms may include shock, anger, despair, emotional numbing, terror, guilt, grief or sadness, irritability, helplessness, loss of interest in activities, and dissociation [39]. Cognitive effects may include impaired concentration and decision-making, memory problems, disbelief, confusion, distorted thinking, decreased self-esteem and motivation, self-blame, intrusive thoughts and memories, and worry. Social and interpersonal impairment, alienation, withdrawal, conflict, work problems, and educational impairment may result. Somatic complaints may include fatigue, disturbed sleep, headaches and other pain symptoms, and gastrointestinal problems [32, 40]. When these symptoms have no detectable medical cause, they are often referred to as medically unexplained physical symptoms (MUPS). These can be very resistant to intervention [41].

8.5 Community Impact and Responses

Much of our knowledge about community responses comes from populations exposed to natural disasters. As described earlier, response to a natural disaster often follows a pattern of initial social support mobilization followed by deterioration in social support [3]. However, in nuclear events, patterns change. The honeymoon phase can be diminished or absent as outside groups may be reluctant to respond to affected areas out of fear of exposure or contamination [42]. In contrast to a natural disaster, the expectation of accountability or blaming will be stronger following nuclear accidents given the inherent human factors involved in causing the event.

8.5.1 Evacuations and Community Disruption

Following a large nuclear incident, entire communities are often evacuated. The Chernobyl accident resulted in more than 200,000 people permanently relocated. In Fukushima, approximately 380,000 individuals were relocated following the nuclear disaster [36]. Individuals who are immediately displaced may not achieve permanent housing for several years, and families and communities will live with uncertainty for a long time. Following nuclear disasters, entire communities may cease to exist, and their members are scattered among evacuation centers with similarly displaced and highly stressed groups of evacuees. This decreases the ability of victims to reduce stress by seeking connections with community members. Groups forced to cohabitate in relocation centers may have preexisting social or cultural conflicts, and new communities who do not know each other often have fears of safety. Ten years after Chernobyl, there was a prolonged tendency toward uncertainty and mistrust of government, even in communities not heavily contaminated, and tendencies to attribute symptoms and illness to radiation exposure or contamination [43].

8.5.2 Stigma Surrounding Individuals with Nuclear Exposure

Unlike natural disasters, victims of nuclear events are often stigmatized in many ways. The most common reason victims face stigma is the fear that they bring nuclear contamination with them out of the evacuation zone. This occurred to evacuees following both the Chernobyl and Fukushima nuclear disasters. In an attempt to reduce stigma following the Goiania disaster, more than 8000 people applied for certification from the Brazilian government asserting that they were free of contamination [44]. They did so in order to overcome discrimination in boarding commercial flights and securing hotel reservations. Similar to past disease epidemics [6], families of victims of nuclear events find it difficult to bury their dead following the event due to fear of radiation from the body or contamination of soil and groundwater. Following Goiania, protesters blocked the burial of victims in the local cemetery [44]. Those displaced from their homes and neighborhoods also find themselves competing for existing resources, community services, and employment. While struggling with the loss of their homes and communities, displaced persons have been housed in temporary structures or must compete for available permanent housing. All familiar community services previously available are no longer accessible, and those displaced must either attempt to establish new services or compete for existing services in their new communities.

It is clear that anxiety concerning radiation exposure and its consequences can have a significant and lasting effect on communities and may persist for years, often generations beyond the event. Adults born 25 years after the Chernobyl incident

still showed significant anxiety over effects of radiation exposure [45]. Research on communities affected by contamination disasters indicates that families have difficulty perceiving homes and communities as safe or desirable, leaving them disconnected from familiar surroundings and resources [46]. The anxiety for victims of nuclear disasters is often compounded by distrust of and hostility toward government and scientific experts. In technological disasters, the distress over loss is increased by the knowledge that the cause is man-made. In the case of Three Mile Island, distrust of authorities was very high after the accident and remained high even after other measures of distress had normalized [47].

Nuclear events impact individual physical and mental health, family and community cohesion, and even the culture of a nation. These impacts may last beyond individual lifetimes.

8.6 Leadership Communication About Disaster Exposure and the Impact on Psychological Health of a Population

Effective leadership is critical to all disaster preparedness, response, and recovery. The positive impact of successful leadership and the negative effects of inadequate and failed leadership are well documented [48–52]. It is also a consistent theme noted in popular nonfiction literature concerning extraordinary events [53–55].

Effective leadership in disasters is a complex task. It requires an array of skills demanded by few other roles. An effective leader in this context needs to integrate and balance the science of the disaster event, complex and changing real-world response, political realities, and compassion. Leaders must be able to communicate effectively within their own organizations, across organizational boundaries, and with a wide variety of diverse elements of the population [51]. The ability to communicative effectively in disaster situations of all types is a key characteristic of successful leaders.

8.6.1 Risk Communication During and After Exposure

The importance of effective communications before, during, and following disasters and other extreme events is well documented [56–58]. Effective communication is actually an important and helpful behavioral health intervention. "Better than any medication we know, information treats anxiety in a crisis" [59]. Communications inform people in ways that influence potentially life-changing behavioral choices. Do I evacuate or shelter in place? Should I go to get my child at school or go to a shelter? Effective communication can promote self-efficacy and provide anticipatory guidance to assist in positive outcomes. It can also manage hyperarousal to

reduce stress-related cognitive problems. Leaders, policy makers, and disaster responders can gain much from collaboration with communications experts.

Effective communication, related to health factors in disaster and emergencies, has an evidence base, and helpful methods for implementation are available [58, 60]. It is important that leaders understand the complexity of effective risk and crisis communication. Leaders can help their communities by incorporating communication scenarios into disaster planning activities. Anticipating what information will be needed to prepare instructional messages before a disaster event, such as a nuclear exposure, can be of value to communities.

It can be challenging to communicate effectively during a disaster or other public health emergency. Some of the strategies may not seem intuitive. For example, many communication strategies are based on changes in how people think and process information during times of stress. Because of these changes, it is important to repeat messages, limit the number of messages presented, and reduce the reading level at which messages are crafted. It is helpful to provide directions and instructions that are simple and specific. Other strategies (See Table 8.3) are more general such as the importance of telling the truth and avoiding false assurances. When information is unavailable or unknown, saying, "I don't know" can build trust and credibility. When this occurs, it is also helpful to commit to finding out the answers and then doing so in a timely manner.

In preparing and implementing crisis communication strategies, leaders should avoid relying too heavily on the written and spoken word. A great deal is communicated, quite powerfully, through behavior that is witnessed, symbols and rituals that promote shared goals, and photographs as well as video images. Communication can be enhanced by understanding the impact of these alternate forms of communication and linking them appropriately and creatively with more traditional written and spoken word. Social media has become an extremely important and impacting mechanism of communication with important behavioral health implications and potential.

Leaders and experts who are not traditionally considered part of the medical, public health, or behavioral health leadership can be enlisted to further behavioral health goals. Consider, for example, the earth sciences, especially seismology. In the aftermath of earthquakes, seismologists nearly always appear in the media.

Table 8.3 Elements of effective risk communication during and after disasters

Repeat important messages
Limit the total number of messages presented
Lower the reading level at which messages are crafted
Provide directions and instructions that are simple and specific
Tell the truth
Avoid false assurances
Say "I don't know" when information is unavailable or unknown
Commit to finding answers and do so in a timely manner

What they say, and how they say it, can have a powerful psychosocial impact [61] as well as providing expert information about earthquakes themselves.

There are special challenges in appropriately addressing risk and crisis communication when nuclear events are involved. Important lessons have been learned concerning communications shortcomings in both Fukushima [62–64] and Chernobyl [65]. In both cases, there were significant risk and crisis communication shortcomings that impacted risk perception. This resulted in a suboptimal official and public response and increased adverse short- and long-term psychosocial consequences.

8.6.2 Misunderstanding of Panic and Impact on Leadership Decision-Making

The term *panic* is widely used in common speech and in the media. It is used to cover a broad, yet poorly specified range of both emotion and behavior. The wide and unscientific use of the term has led to a number of false and, ultimately, dangerous assumptions. Panic – meaning disorganized behavior – is not common in disasters. Common misperceptions have resulted in disaster and emergency preparedness and response based on misunderstanding rather than real experience and evidence. There is a common misconception that panic is widespread and easily triggered [66, 67]. An assumption that panic will often and easily occur can lead to poor preparedness and response planning and execution [68]. Leaders should know about the nature and dynamics of community fear, concern, and distress (and other far more common anxiety-related consequences) and prepare and respond accordingly. Effective leaders communicate accurate information effectively. When this occurs, all benefit. Providing accurate information and assurances consistent with the principles of evidence-based risk and crisis communication enhances the perception of leaders by the public. It also promotes appropriate pro-social behaviors in the impacted population.

8.7 Conclusion

Disasters produce a range of psychosocial responses including distress reactions, health risk behaviors, and mental disorders. In many cases, fear of nuclear exposure causes a range of psychological and physical symptoms that exceed actual health risk. Community responsiveness, cohesion, communication, and leadership all play an important role in enhancing adaptive behaviors and emotional recovery after a nuclear event. Governments and community leaders that understand the psychosocial nature of disaster phases can anticipate needs and plan accordingly. Training and education for all personnel who write policy, plan and coordinate activities, or

directly respond to disasters, allow for a better understanding of unique and diverse disaster-specific, psychosocial issues [69].

There is growing worldwide recognition that psychosocial issues are an integral part of health, specifically disaster preparedness and response. Recommendations made to the United Nations in support of the Hyogo Framework for Action 2, which provides guidance to the international community on disaster risk management, observed that a fundamental aspect of managing the well-being of a population following a disaster is to ensure that psychosocial issues are treated as an integral part of healthcare [70].

The visible nature of physical injuries often leads those managing a disaster to prioritize these and can result in delayed care or a failure to identify the significant psychosocial effects of the event that invariably occur. Historical experience of nuclear exposures demonstrate that psychosocial effects are generally far more common and experienced over a much longer period of time than observable physical injuries or associated medical conditions. Ensuring that psychosocial concerns are anticipated in response to a nuclear disaster allows governments, community leaders, and healthcare personnel to more effectively prepare for and respond to the event, which decreases the negative impact on an affected population.

Timely and accurate ongoing communication from credible, trusted sources is an essential aspect of managing disasters and particularly important in response to nuclear accidents. An appreciation of the unique cultural aspects and variations in communication style will enhance the ability of leaders to effectively inform and partner with all those affected by a nuclear event.

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