CLIMATE-RELATED DISASTERS
Understanding Causes, Consequences, and Interventions
to Protect Community Mental Health

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Climate-Related Disasters: Understanding Causes, Consequences, and Interventions to Protect Community Mental Health

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Abstract:
Climate-related disasters are a profound and devastating effect of a changing global climate. These events result in an established range of individual psychological and behavioral responses as well as a predictable pattern of community responses that evolve over time. Unlike the medical impact of climate-related disasters, various factors enhance the transmission of mental health effects beyond the geography of the event. Subsequent and co-occurring disasters, such as the global COVID-19 pandemic, amplify distress and significantly complicate disaster response and community recovery. Certain populations are particularly vulnerable to the mental health effects of disasters with various communities disproportionately bearing the impacts. Understanding the effects of disasters, where risk is concentrated, and how it changes throughout the course of disaster response and recovery are important to optimize interventions. Evidence-informed interventions can reduce distress, improve well-being, enhance functioning, and foster sustainment for individuals, organizations, and other communities. Effective preparedness requires understanding these factors, incorporating them into all aspects of disaster management, and ongoing education and training for disaster planners, responders, and the public.

Key Highlights:
• Climate-related disasters are profoundly disruptive and produce psychological and behavioral effects that significantly exceed the physical health impact of the event.
• Distress reactions and health risk behaviors are early and common responses to climate-related disasters that produce significant morbidity and functional impairment, and negatively impact operational sustainment.
• Risk and protective factors in disasters result from pre-event factors, aspects of impact, and recovery variables. Risk is not distributed equitably and changes over time.
• Public mental health interventions in disasters are scalable and address a range of community needs to promote resilience and foster community recovery.

Recommendations:
1. Public health early interventions that are scalable are essential to support community mental health during climate-related disasters.
2. Distress and risky behaviors are early responses to disasters, that should be the focus of prevention and wellness interventions.
3. Public health and community surveillance that is conducted early and regularly throughout all phases of disasters helps identify areas of evolving risk to ensure timely and tailored resources are delivered to those most in need.
4. Early interventions use an evidence-based framework based on the essential elements of Psychological First Aid (safety, calming, self- and community-efficacy, social connectedness, and hope) to enhance well-being, reduce distress, and mitigate disorders.
Disasters are severely disruptive events that overwhelm community resources and can outpace coping capacity of an affected community. Climate-related disasters can be abrupt, extreme weather events, unfolding over minutes or hours (hurricane, tornado, tsunami), or slow-moving events that span days, weeks, or months (wildfires, floods, droughts). Other disasters include natural disaster events, such as earthquakes, and biological events like the global COVID-19 pandemic. Human-generated disasters can be intentional, such as mass shootings and war, or unintentional, including accidents like an airplane crash or industrial fire. Many disasters include elements of natural or climate-related events that are further exacerbated by human behaviors. For instance, Hurricane Katrina started as a storm, but poorly maintained levees resulted in the catastrophic flooding that killed two thousand and displaced over one million people. The COVID-19 pandemic may have originated through an animal reservoir but was then spread around the world by human travel and close contact. The global COVID-19 pandemic remains an active public health emergency around the world, with the virus infecting more than 579 million people and killing over 6.4 million as of this writing. The pandemic has remained a primary focus of global health efforts and a threat to global health security. However, climate-related disasters continue to impact the world. In fact, data from the Center for Research on the Epidemiology of Disasters indicates that climate-related disasters are increasingly common and becoming more costly; Figure 1 lists climatological (e.g., wildfires), meteorological (e.g., storms, extreme heat), and hydrological (e.g., floods) events from 1900-2021. These changes are attributed in part to a changing global climate, one of the greatest threats to global health in the 21st century. These disasters create disruption through physical injury and death, damage to property, displacement of individuals and families, and prolonged disruption to a broad range of services upon which communities rely, ultimately resulting in significant psychological distress. The convergence of climate-related disasters with other events, such as war, pandemics, and other disasters can further distress and complicate response and recovery efforts.

**Figure 1: Frequency and Financial Cost of Climate-Related Disasters by Type and Year**
The increased frequency of climate-related disasters further the need for improved planning to mitigate the adverse effects of these events. All-hazards planning addresses the full spectrum of threats from all types of disasters and is the current framework for global disaster management. Communities (schools, neighborhoods, healthcare facilities, workplaces) have unique needs that benefit from tailored planning and preparedness. Effective preparedness improves response and recovery following a disaster and may reduce overall resource requirements. As noted in the *Disaster Behavioral Health* paper as part of the National Association of State Mental Health Program Directors *Ready to Respond 2021* series, disaster behavioral health is increasingly a part of disaster management.

Disasters strike at the fault lines of communities by exacerbating divisions around issues of race, socioeconomics, religion, and other areas within specific contextual factors of a given community. Different factors impact the community experience of a disaster (Table 1).

### Table 1: Factors Impact Community Experience of Disaster

<table>
<thead>
<tr>
<th>Factor</th>
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<tbody>
<tr>
<td>Prior exposure to disasters</td>
</tr>
<tr>
<td>Politicization of disaster and response efforts</td>
</tr>
<tr>
<td>Disparities in pre-existing socioeconomic resource</td>
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<tr>
<td>Religious and cultural beliefs attributed to the meaning of the disaster</td>
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<tr>
<td>Trust in institutions and officials (elected officials, law enforcement, aid organizations)</td>
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<tr>
<td>Prior experiences with national and/or international government intervention</td>
</tr>
<tr>
<td>Additional co-occurring disasters (e.g., a hurricane during a pandemic)</td>
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<tr>
<td>Presence of litigation</td>
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Disasters in which cultural and contextual factors were critical to community partnership and effective response include: 1) Hurricanes Katrina and Rita in 2005, which were characterized by perceived disparities in response efforts within affected communities of color, 2) the 2010 earthquake in Haiti, which required knowledge and incorporation of voodoo as a religious ritual integral to how citizens conceptualized and responded to healthcare interventions, and 3) COVID-19 pandemic in which willingness to engage in protective health behaviors was significantly impacted by political party affiliations. Each of these events, as with all disasters, necessitated an understanding of sociocultural and contextual factors within the communities to optimize response and recovery efforts. These and other factors create a disaster ecology in which various forces of harm impact individuals, communities, and societies.

How the psychological response to disaster across large and diverse populations is managed is, perhaps, the most critical factor in a community’s ability to recover. Effective interventions are rapid, coordinated, and sustained. Leadership is critical, particularly knowledge of community resilience and vulnerability as well as awareness of how community members respond to major events. Coordinated approaches across emergency response, medical systems, behavioral health and public health are essential to address mental health of disaster affected populations.

All hazards planning focuses on preparedness to address the full range of threats to communities, including both climate-related and other disasters. The Haddon Matrix is a risk management planning tool that considers the host, agent/vector, and physical and social environments across the pre-event, event, and post-event time periods (Table 2). The use of an established framework that addresses
factors across various phases of disaster ensures planning and preparedness activities are comprehensive and structured, reducing the chance that disaster managers overlook important factors during the high stress environment of disaster response. Effective planning can also reduce distress for affected personnel and community members and optimizes access to needed mental health care and other resources in the wake of a disaster.

**Table 2: Haddon Matrix applied to a Hurricane**

<table>
<thead>
<tr>
<th>Host</th>
<th>Agent/Vector</th>
<th>Physical Env</th>
<th>Social Env</th>
</tr>
</thead>
</table>
| **Pre-Event**             | -Response training  
-Public education  
-Personal/family preparedness  
-Pre-existing mental & physical health | -Proximity to infrastructure  
-Resilience of structures to impact  
-Early warning systems | -Culture of readiness  
-Knowledge of roles  
-Baseline trust  
-Culturally based risk perceptions |
| **Event**                 | -Protective behaviors  
-Notification speed | -Duration and intensity  
-Location and movement  
-Emergency medical systems and training | -Identification of risk indicators  
-Knowledge of care services (where/how)  
-Barriers to care |
| **Post-Event**            | -Evacuation  
-Psychological resources  
-Resiliency | -Response and recovery systems and infrastructure | -Comm/Org response to communication  
-Grief leadership  
-Access to crisis resources |

Psychological and behavioral health impacts represent a significant portion of human suffering and healthcare expenditure following climate-related disasters. Following Hurricanes Katrina and Rita in 2005, cost modeling revealed that screening and evidence-based treatment in the affected population for just three common mental disorders would cost nearly the same as subsequent restoration of the failed levy system around New Orleans (which was the source of catastrophic flooding leading to property damage as well as most injuries and deaths). Repairing the damaged levy system in advance of the disaster would have cost just a portion of the overall expense to healthcare and human suffering.

It is also critical to understand the relationship of disaster exposure to chronic health conditions, specifically those that do not result from disaster-related injury but, instead, changes in health behaviors that lead to chronic disease and associated public health burden. A pre- (2015) and post-study (2019) to understand the effects of Hurricane Maria (2017) on reported chronic health diseases in residents of Puerto Rico found elevated rates of abdominal obesity, sedentarism, hypertension, triglycerides, and binge drinking. These modifiable health diseases result largely from adverse health behaviors that may be influenced by exposure to extreme stressors and traumatic events, such as climate-related disasters. An understanding of the economic costs to mental and physical health allows for more informed decision-making regarding disaster preparedness and management.
Psychological and Behavioral Effects of Climate-Related Disasters

Following climate-related disasters, many people will be okay and promptly recover previous function. Though many are affected by the event, they are able to manage social and occupational responsibilities and expectations. Some people ultimately develop an enhanced perception of their ability to manage future stressors, sometimes referred to as post-traumatic growth. These are important messages because they acknowledge the reality of climate-related disasters, but also foster a sense of hope for the future. Even though most people recover, many will experience some degree of adverse mental health effects. The psychological and behavioral effects of climate-related disasters begin immediately following the event and may persist for extended periods of time, extend beyond the geographic region directly impacted by the event, and are experienced within the broader cultural and contextual factors of a community. Adverse mental health effects of disasters are a significant public health concern that creates considerable human suffering and adverse effects on community functioning. Hurricane Harvey, which was a category 4 hurricane, made landfall in August of 2017 in Texas and Louisiana, ultimately inflicting $125 billion in damages, the second costliest hurricane in U.S. history. Harvey’s rainfall averaged more than 40 inches over a four-day period, flooding hundreds of thousands of homes and displacing nearly 30,000 people. The Health of Houston Study, which collects population level data, was used to compare pre- and post-Harvey community data, in which respondents reported an average increase of 1.31 poor mental health days per month, which exceeded the reported increase of 1.12 poor physical health days per month.¹¹

Considerations of adverse psychological and behavioral effects often focus on psychological disorders, such as posttraumatic stress disorder (PTSD), depression, and others. Disorders do occur following disasters and result in significant morbidity and mortality, warranting prompt assessment and evidence-based treatment. However, disorders often take weeks, months, or years to emerge. Earlier and more common responses, including distress reactions and health risk behaviors (Figure 2),¹² produce the bulk of the mental health burden, particularly in the early hours, days, and weeks after a disaster. They are important targets for early interventions (discussed in a later section) that foster resilience and protect mental health. When these responses present to healthcare, concerns such as insomnia, fear, and altered substance use are typically identified in primary care and emergency settings. It is critical that healthcare systems ensure providers in these settings have education in disaster mental health and are properly resourced following disasters to manage the predictable responses. For instance, after a hurricane, large numbers of community members may present with concerns of difficulty sleeping. An awareness that problems with sleep may be the result of an altered sense of safety and an inability to feel calm after a life-threatening event should inform diagnoses, prognosis, treatment planning, and patient education. Understanding the range of adverse mental health effects can enhance planning, preparedness, response, and recovery efforts by disaster managers, healthcare personnel, and community members. Embedding mental health personnel with training in disaster mental health principles into these healthcare settings can facilitate rapid identification, triage, and interventions for early responses to disasters.

Because disasters impact local, regional, and national communities, easily accessible national resources are important to support community mental health after disasters. The National Distress Helpline (1-800-985-5990), sponsored by the Substance Abuse and Mental Health Services Administration (SAMHSA), is an important resource to assist community members experiencing psychological distress following disasters. The helpline provides multilingual crisis counseling services 24 hours a day, 365 days
a year to assist community members with disaster-related distress. It augments the counseling services available through the 988 Suicide and Crisis Lifeline, which offers assistance to individuals experiencing any type of mental health crisis. In the wake of disasters, SAMHSA’s Crisis Counseling Assistance and Training Program (CCP), funded and implemented by the Federal Emergency Management Agency, provides short-term disaster relief grants for states, U.S. territories, and federally recognized tribes following a presidential disaster declaration and are used to support community-based outreach, counseling, and other mental health services to survivors of all types of disasters.

Figure 2: Psychological and Behavioral Responses to Disasters

Distress reactions are early and common manifestations following traumatic events, representing the bulk of early public mental health burdens following climate-related disasters. Insomnia is common and increases the risk for other psychological and physical health problems. Belleville and colleagues found that even three months after the evacuation following the Fort McMurray wildfires in Canada, 43.6% of the evacuees reported insomnia, which was more prevalent than PTSD, depression, or anxiety. Anger is common following disasters and is associated with an increased likelihood of negative mental health outcomes. Decreased sense of safety, distractibility, guilt, demoralization, and loss of faith can also occur.

Distress often results from the complex interaction of various factors in the post-disaster environment. For instance, following a hurricane, wildfire, or flood, community members may be forced to evacuate their homes, ultimately residing transiently in shelters, makeshift lodging, or camps. These are often cramped, noisy, and have minimal security. This environment may feel unsafe, making sleep more difficult. The resulting insomnia reduces the ability to manage strong emotions like anger, leads to distractibility, and diminishes problem-solving skills resulting in difficulty making decisions that protect the health and safety of the individual and their family. An awareness of these potential cascading...
events is essential for disaster planning and response. Public mental health interventions should address environmental factors to reduce distress and improve functioning.

Health risk behaviors are maladaptive coping strategies to manage distressing emotions and include increased use of tobacco and alcohol. Increased use of alcohol, regardless of whether someone has a disorder, is a significant public health problem associated with increased rates of accidents, interpersonal violence, workplace presenteeism and errors, and a range of adverse physical and psychological health effects. Though less commonly studied than changes in substance use behavior, some disasters have been associated with the initiation of substance use. In a study of 37,867 individuals who were non-drinkers prior to the Japan triple disaster in 2011, 9.6% reported starting drinking in 2012; among those who started drinking, 53.8% continued drinking in 2013. Following climate-related disasters, individuals may restrict their activities or become isolated, which can limit the utilization of important healthcare and social support resources. Over-dedication to disaster response activities may lead individuals to overlook important social and occupational responsibilities. Primary care and emergency department personnel are critical in the identification of high-risk health behaviors following disasters and initiation of interventions including education, basic self-care actions, linkage to additional support services, and follow up continuity. Telehealth and virtual support, which have become increasingly accessible during the COVID-19 pandemic, can aid in providing timely and tailored support to mitigate distress for disaster responders as well as victims, Public health messaging from community leaders and the media are important sources of education information, including information about normal responses to disasters, risky health behaviors to avoid, protective and health-promoting coping mechanisms, warning signs that additional help may be warranted, and where to get help if needed.

Psychiatric disorders may also develop following climate-related disasters, which result in significant morbidity and mortality that requires healthcare interventions. The most studied are PTSD, depression, and anxiety. A review of the impact of wildfires by To and colleagues found rates of various psychological disorders elevated 3 months after the event for PTSD (24-60%), depression (25-33%), and anxiety (17.4-27%). Population level screening, assessment, and evidence-based interventions are clinical best practices.

The extreme and prolonged stress of climate-related disasters have led to concerns about suicide in those impacted by disasters. It is clear that recovery following disasters is often prolonged and stressful. Health, financial, occupational, and family stressors mount, though coping capacity may be reduced while external support and government resources diminish. As a result, suicide receives significant attention in healthcare and media following disasters. Suicide is a complex and devastating event and, though rare overall, rates of suicide outside of disaster contexts have increased in the United States in the past 20 years. However, there are limited studies examining the associations of suicide with climate-related and other disasters. Some find that suicidal thoughts and behavior increase, likely resulting from a milieu of pre- and post-disaster factors that overwhelm coping capacity. Reifels and colleagues examined population level data in Australia and found that suicidal behavior was increased in those exposed to multiple, but not single, disaster events. Importantly, some research has observed suicidal thoughts and behavior to diminish moderately from baseline in the early weeks and months following a climate-related disaster consistent with the “Honeymoon” phase of community recovery, but then increase from baseline during the ensuing months and years corresponding to the “Disillusionment” phase (Figure 3).
Interpersonal violence has been shown to increase following climate-related disasters, with women and children being most affected. In a study of the impact of the 2009 bushfires in Victoria, Australia, increased violence against women was highest for those in areas most affected by the fire and families in which income loss occurred because of the fires. In addition, displacement and migrations, food scarcity, breakdown of community infrastructure, loss of employment, and diminished social connectedness have negative psychological and behavioral health consequences after climate-related disasters.

Grief is a nearly universal reaction after climate-related disasters and occurs in response to profound loss. Losses can include one’s home and cherished mementos, community support, comfort routines, familiar surroundings, and even the lives of friends, loved ones, and cherished pets. Displacement to evacuation centers and shelters may further lead to the loss of a sense of safety and security. Traumatic grief from the abrupt death of a loved one resulting from the disaster increases adverse mental health outcomes. A study of bereaved Norwegian family members whose loved one died during the 2004 Southeast Asian tsunami found that 36% of respondents had a psychiatric disorder six years after the event, and those with prolonged grief disorder were more likely to have persistent functional impairment. Enduring resources available to disaster-affected communities that address issues of grief improve community functioning and recovery.

**Children and Adolescents**

After disasters, children may have reactions like adults. They also have additional reactions based on their developmental stage and other factors, which can be easily overlooked or misinterpreted. For example, the reasons for “acting out” or behavioral dysregulation in a child in distress following a disaster may be relatively unnoticed by parents, educators, and school administrators who are distracted and experiencing elevated stress themselves. Younger children may revert to earlier childhood behaviors, such as loss of toilet training, desire for stuffed animals and comfort objects, and increased need for physical closeness and proximity to caregivers. Older children and adolescents might display aggression, diminished academic performance, and social isolation. Separation from primary attachment figures, parental distraction and family strife, and disruption in schedules and routines increase distress and adverse mental health for children and adolescents. Important interventions can help address some of the challenges that youth may face (Text Box). Ensuring the well-being of caregivers is also essential in protecting the mental health of children and adolescents; when the needs of caregivers are met, they have the physical and mental resources to attend to the needs of children. Education and support resources for caregivers, teachers, and other school personnel can aid in the identification of distress reactions in youth and the timely delivery of effective interventions.

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**Interventions that may help children post-disaster:**

1) Keep children and adolescents close to trusted caregivers,
2) Re-establish routines after evacuation or displacement,
3) Answer questions they ask but avoid providing excessive details based on caregiver concerns,
4) Share information in language appropriate to developmental stage.
Exposure and Contamination

Climate-related and other ecological disasters can also result in infrastructure damage that creates a risk of exposure and contamination by chemical, biological, radiological, or nuclear (CBRN) material. These require specific public health preparedness measures. Overflowing waste treatment plants after Hurricane Harvey, damage to nuclear facilities after the tsunami in Fukushima, and human corpses inadvertently exhumed by flooding after Hurricane Katrina create unique psychological and behavioral responses within affected communities. In 2011 on the island of Honshu, Japan, an earthquake and tsunami damaged nuclear power plants in Fukushima, exposing the community and environment to nuclear material. Subsequent fear and uncertainty about nuclear contamination led to ostracizing and hostility toward displaced individuals from the region. CBRN materials are perceived as mysterious and dangerous, as well as novel and unfamiliar to most citizens, disaster managers, and healthcare professionals. Uncertainty about exposure, concerns about isolation and quarantine, and fears of shortages for needed prophylactic and treatment medications increase distress, distort perceptions of risk, and alter the willingness of community members to participate in health behaviors required to properly respond and manage these events.

CBRN events lead to surges in healthcare demand with anxiety related somatic symptoms, often referred to as Medically Idiopathic/Unexplained Physical Symptoms (MIPS/MUPS). The risk of CBRN exposure highlights the importance of the perception of risk, which is typically much higher than the actual risk. Public health education is critical to inform the public on actual risks, steps being taken to mitigate them, and when to get additional help. Healthcare facilities should be prepared to receive and triage high volumes of individuals presenting with elevated levels of somatic concerns related to fear of exposure. Mental health personnel trained in the effects of mass trauma and evidence-based interventions, embedded in emergency and primary care/general medical care settings, can provide support and initiate early interventions to reduce distress. In addition, planning should account for increased rates of absenteeism among healthcare workers who may fear exposing themselves and family members to CBRN agents or concerns about the adequacy of equipment, policies, and procedures to protect healthcare workers safety during such an event.

Compound Effects of Disasters

Climate-related disasters may also occur during a CBRN or other ecological disaster event, such as the global COVID-19 pandemic. In the United States, wildfires, tornadoes, floods, hurricanes, as well as human-generated mass violence events, all occurred during the pandemic. This “collision of disasters” complicates the experience of each disaster for community members, as well as disaster planning, response, and recovery efforts, and is often found to exacerbate mental health effects above and beyond what is seen during a single disaster event. Agyapong and colleagues examined the mental health effects of exposure to the Fort McMurray wildfires in 2016, regional floods in 2020, and the COVID-19 pandemic. When compared to those who only experienced the COVID-19 pandemic, those exposed to the pandemic and either wildfires or floods, as well as those exposed to the pandemic, floods, and wildfires, had markedly higher rates of symptoms of generalized anxiety disorder and PTSD.

Though life stressors can ultimately create growth for some, the enhanced effects of multiple disaster events may result in worse mental health, particularly in the subsequent weeks and months following the event. Beyond co-occurring disasters, certain disasters may lead to other disasters, such as
Hurricane Katrina, which ultimately caused most of the disruption and morbidity from subsequent flooding due to damaged levees. Individuals may also be exposed to the same type of disaster repeatedly, with increased risks in disaster prone areas and for those who are unable or unwilling to relocate. In a multi-wave study of Florida residents, those exposed to Hurricane Irma in 2017 and subsequently to Hurricane Michael in 2018 reported higher levels of posttraumatic stress symptoms, distress, and impairment in function, with those who experienced storm-related loss, injury, or evacuation having the most persisting symptoms. Given the increasing frequency and severity of climate-related disasters (see Figure 1), community planning should consider efforts to address unique risks and concerns of individuals with previous disaster exposure.

The Role of Media

Media is an important source of information for disaster affected communities, providing information on evolving risks, recommended health behaviors, and access to resources. Media also transmits fear and distress. Most studies of media in disasters have examined the impact of media consumption following mass violence. However, research after climate-related disasters, such as hurricanes, finds an increased consumption of disaster-related television and social media is associated with a range of adverse psychological effects. A multi-wave study by Thompson and colleagues examined the impact of media consumption during Irma’s landfall and one month after landfall on the subsequent development of posttraumatic stress (PTS), which revealed increased media consumption was associated with higher levels of PTS. Increased media consumption may also represent efforts to control or alleviate distress in those already experiencing it, with causal relationships not clearly established.

In addition to the transmission of distress, there is increasing evidence from studies of the COVID-19 pandemic, that media, particularly social media, represents an increasing source of misinformation. Although the role of media-derived misinformation in climate-related disasters is not well studied, the proliferation of social media as a primary news source for many citizens, coupled with the extraordinary adverse public health implications of misinformation, disaster planners should anticipate and prepare to counter misinformation regarding climate-related disasters.

The media will understandably expect to hear from those involved in disaster management. Community leaders, responders, and healthcare personnel engage with the media during disaster response and recovery. Working collaboratively with media helps ensure timely, accurate dissemination of important public health information. Abruptly displaying graphic content can enhance distress for viewers. In addition to balanced reporting of risks and protective aspects of a disaster, encouraging the media to provide warnings before showing graphic disaster-related material allows people to reduce abrupt and unintended exposure. While indicating the date of the content shown helps lower fear and distress for individuals who may otherwise believe an additional disaster event is occurring.

Tips for Contacting Media and Disaster Graphic Content

- Collaborate with media to facilitate clear, timley, accurate dissemination of important public health information.
- Displaying graphic content can enhance distress, if it needs to be shown, provide warnings in advance of what is forthcoming.
- Provide the date of any images of recent past disaster content content to lower fear of ongoing disaster events.
Community Phases of Disaster

Following a climate-related disaster, particularly those involving a single acute event that occurs over a discrete period (e.g., hurricane or tornado), communities progress through psychological and behavioral phases of response (Figure 3). Several of these phases inform important considerations of disaster planning and resource allocation.

Figure 3: Psychological and Behavioral Phases of Disaster

![Diagram of the psychological and behavioral phases of disaster](https://files.eric.ed.gov/fulltext/ED459383.pdf)

The *Honeymoon* phase coincides with increased availability of government, volunteers, and international assistance. Community bonding occurs through a shared catastrophic experience as well as giving and receiving assistance. Survivors are more hopeful and optimistic the help they receive will restore them to wholeness. Disaster mental health workers are more accepted by community members and can develop a foundation on which to assist in difficult phases ahead. The subsequent phase of *Disillusionment* is characterized by disappointment as the presence of disaster assistance agencies and volunteer groups diminish and hopes for restoration to pre-disaster “wholeness” go unmet. Community cohesion often diminishes as people focus more on unmet needs. Resentment may surface as survivors receive unequal monetary compensation for what they perceive as similar damage. Less impacted neighboring communities may have returned to life as usual, which can discourage and alienate those more severely impacted. Survivors may become physically exhausted due to growing financial pressures, unaddressed medical concerns, family strife, stresses of relocation or home repair, bureaucratic hassles, and limited self-care. The disaster “Anniversary” experience occurs during this phase and serves as an important opportunity for leaders to support the psychological well-being of victims through openly acknowledging and memorializing losses, helping make meaning of the event, and looking hopefully to the future. Failure to address a disaster anniversary experience often demoralizes survivors, exacerbates
distress, and impairs community recovery. The *Reconstruction* phase lasts for years, and survivors attempt to rebuild homes and communities as well as social and occupational identities. Some will accept new circumstances, find meaning, and even increase strength in the ability to manage future disasters. Others may remain caught in a cycle of despair and hopelessness, possibly assuming the identity of a victim.

Disaster planners and victim service providers should understand the characteristics and evolution of these psychological and behavioral responses over time. Those with more severe exposure and impact, limited resources post-disaster, and lower coping skills are more likely to develop persistent symptoms requiring additional interventions. Anger is often directed at caregivers and community leaders if these factors are not sufficiently accounted for in medical and psychological response plans. In addition, in communities with lower resources or trust in government and institutions, these phases may be altered. Lower acceptance of support from outside the community may change the ability to optimize response and support efforts. A disaster involving concerns about exposure and contamination often alters these phases, such as limiting the “coming together” typically characterizing the *Honeymoon* phase due to fear of contracting illness from other community members. Anticipating and planning for various disaster-specific factors, including their impact on these established community psychological and behavioral phases is critical to timely and effective disaster response and recovery efforts.

**Key Points of Psychological and Behavioral Effects of Climate-Related Disasters:**

1. Response to climate-related disasters includes distress reactions, health risk behaviors, psychiatric disorders, and resilience. Understanding the psychological and behavioral impacts and where these are present within a community enables the development of comprehensive recovery plans.
2. Psychological and behavioral responses to climate-related and other disasters occur along a continuum of stress. Interventions that extend beyond a focus on psychological disorders facilitates the development of interventions that lower barriers to care.
3. The impact of climate-related disasters unfolds over time with adverse effects on community functioning and occupational performance, which are important targets for interventions that protect health and enhance individual functioning and sustain operations.

**Risk and Resilience in Disasters**

Risk and protection in climate-related disasters result from various factors, including pre-event characteristics, event impact, and recovery variables (Table 3). Various populations are at increased risk for adverse mental health effects of climate-related disasters and warrant special consideration in disaster preparedness, response, and recovery.
**Table 3: Risk Factors to Mental Health Effects of Disasters Across Disaster Phases**

<table>
<thead>
<tr>
<th>Pre-Event Characteristics</th>
<th>Event Impact</th>
<th>Recovery Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socioeconomic Status</td>
<td>Duration &amp; Severity of Exposure</td>
<td>Relocation</td>
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<tr>
<td>Social Support</td>
<td>Displacement</td>
<td>Financial Stress</td>
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<td>Gender</td>
<td>Home Damage</td>
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<td>Age</td>
<td>Physical Injury</td>
<td>Social Support Loss</td>
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<tr>
<td>Reliance on Care Systems</td>
<td>Bereavement</td>
<td>Job Loss</td>
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**Individual Characteristics and Differential Impact of Disasters**

Lower socioeconomic status is often associated with worse outcomes following disasters, as those with less financial resources often reside in locations that are more prone to and less resistant to the effects of climate-related disasters. Also, they often receive care in systems less equipped to address the full needs of disaster victims. Less financial resources increase risks for homelessness, reduced preparedness behaviors, barriers to evacuation, limited access to healthcare, and subsequent psychological distress and disorder. Those experiencing homelessness have additional challenges, including an absence of a physical dwelling structure for protection, lack of access to disaster preparedness information, decreased means of communication, and high rates of chronic medical and mental health conditions.

Individuals with pre-existing mental health conditions, particularly those with serious mental illness (SMI), often experience difficulties following large-scale community disasters. Like others, most with mental health conditions will rise to the occasion and participate in disaster response efforts. However, people with mental health conditions may be less prepared for disasters than others, experience disruptions in their ability to attend clinical care activities, and have difficulty obtaining medications or accessing support services. Individuals taking psychotropic medications may experience diminished heat regulation and impaired fluid homeostasis during extremes of temperature, resulting in adverse medical events. Diminished community infrastructure, higher rates of poverty, and co-occurring substance use increase the risk for people with SMI.

Children and adolescents experience increased risk for adverse psychological and behavioral outcomes following climate-related disasters with elevated rates of PTSD, anxiety, depression, behavioral disruption, and substance use. Parental loss, distractions, and distress following a disaster are important predictors of child well-being. In addition, the quality and style of the parenting relationship are important aspects of child vulnerability. A review of factors associated with recovery in youth following natural disasters revealed that female gender, more life stressors, greater trauma exposure, negative coping, and lower social support, increased risk of negative mental health effects.

Literature on the vulnerability of older adults to disasters is mixed, with some studies revealing increased rates of adverse mental health outcomes. However, age can also be protective, providing greater life experience in managing adversity and enhanced stress tolerance. Overall, research suggests that risk is predominantly associated with conditions of aging (cognitive difficulties, mobility limitations, vision impairment, dependence on systems of care), rather than age per se. Ensuring that disaster messages are understandable, availability of transportation, and optimizing access to care in the post-disaster environment all serve to enhance outcomes for older adults.
Women may be at increased risk for adverse psychological outcomes following disasters. Several factors may contribute to this finding. Women are often increasingly burdened with managing the distressing social dynamics that occur in a family impacted by disaster. Intimate partner violence increases in both frequency and severity following disasters, with victims predominantly being female. In communities affected by civil unrest and war, women more commonly than men experience polyvictimization because of theft, physical assault, and sexual harm. Pregnancy and post-partum women are also at increased risk for mental health challenges following disasters.

First responders and public health emergency workers are exposed to trauma and a range of stressors during non-disaster work but may be especially so during climate-related disasters and experience increased mental health burdens. These challenges result from a range of individual, organizational, and leadership factors across the disaster life cycle as highlighted in Table 4. These individuals often have a considerable stress burden in the response and recovery phase of disaster events. Stressors include long work hours, exposure to severe injuries and mass death, high pressure to perform, and potentially also being a disaster victim, whose own family needs additional support. Responders may experience “psychological identification” during exposure to human remains (“that could have been me” or “that could have been my child”), an aspect of disaster exposures for which training is often absent or inadequate. These exposures, coupled with “psychological identification”, increase the risk for adverse mental health effects including depression and posttraumatic stress. A study of first responders (police, firefighters, emergency medical, and city workers) involved in Hurricane Katrina response efforts revealed that at six to nine months post-disaster, 40% reported increased alcohol use and 25% reported high levels of depression; the latter persisting at 18 months post-disaster. The use of high-quality training, strong organizational and leadership support, as well as formal peer support, have shown promise in protecting the mental health of responders in disasters.

**Table 4: Risk and Protective Factors for Disaster Responders**

<table>
<thead>
<tr>
<th>RISK FACTORS</th>
<th>PROTECTIVE FACTORS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRE-EVENT PERIOD</strong></td>
<td></td>
</tr>
<tr>
<td>• Active health problems, mental health, substance use</td>
<td>• Positive health status</td>
</tr>
<tr>
<td>• Need for access to self/family healthcare</td>
<td>• Availability/use of health resources</td>
</tr>
<tr>
<td>• Limited/poor coping skills</td>
<td>• Limited exposure to adverse environmental health factors</td>
</tr>
<tr>
<td>• Limited social supports</td>
<td>• History of positive adaptation to stress or stress resistance</td>
</tr>
<tr>
<td>• Financial difficulties</td>
<td>• Hopeful outlook</td>
</tr>
<tr>
<td>• Lack of training</td>
<td>• Creative coping skills/strategies</td>
</tr>
<tr>
<td>• Poor team cohesion</td>
<td>• Screening and identification of health risk status</td>
</tr>
<tr>
<td>• Resistance to help-seeking</td>
<td>• Reducing stigma for non-frontline personnel</td>
</tr>
<tr>
<td></td>
<td>• Adequate training and preparation</td>
</tr>
<tr>
<td><strong>EVENT/IMPACT PERIOD</strong></td>
<td></td>
</tr>
<tr>
<td>• Requirement to use crisis (altered) standards of care</td>
<td>• Short duration, minimal disruption to work/personal life</td>
</tr>
<tr>
<td>• Inadequate equipment</td>
<td>• Community fabric intact</td>
</tr>
<tr>
<td>• Moral distress/injury</td>
<td>• Adequate equipment</td>
</tr>
<tr>
<td>• High exposure to infection</td>
<td>• Exposure risks and sacrifices shared equitably</td>
</tr>
<tr>
<td>• Exposure to death, dying, and human remains</td>
<td></td>
</tr>
<tr>
<td>EVENT/IMPACT PERIOD (CONT.)</td>
<td>RISK FACTORS</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>• Required work outside specialty training</td>
<td>• Clear communication about evolving infection control and safety policies &amp; procedures</td>
</tr>
<tr>
<td>• Weakened community fabric</td>
<td>• Supportive &amp; accessible leaders</td>
</tr>
<tr>
<td>• Punitive or unsupportive work environment</td>
<td>• Help-seeking organizational culture</td>
</tr>
<tr>
<td>• Toxic leadership</td>
<td>• Regular monitoring of health and BH status through multiple means</td>
</tr>
<tr>
<td>• Lack of empathy</td>
<td>• Early identification and intervention with health and BH issues</td>
</tr>
<tr>
<td>• Poor communication</td>
<td>• Accessible supports, interventions, and referral options</td>
</tr>
<tr>
<td>• Death of loved ones</td>
<td>• Monitor impact of organizational status and change on wellbeing of all personnel</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RECOVERY PERIOD</th>
<th>• Illness stigma from neighbors/family/friends</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Disjointed community response</td>
<td>• Strong workplace and personal support</td>
</tr>
<tr>
<td>• Isolation from social support systems</td>
<td>• Range of supports and interventions</td>
</tr>
<tr>
<td>• Inability to grieve</td>
<td>• Options and opportunities for personnel interactions</td>
</tr>
<tr>
<td>• Job loss</td>
<td>• Family friendly personnel policies and strategies</td>
</tr>
<tr>
<td>• Extended virtual/home school requirements</td>
<td>• Adaptation to changing patterns of needs, demands</td>
</tr>
<tr>
<td>• Lack of access to child-care</td>
<td>• Work culture continues to encourage interventions and support</td>
</tr>
<tr>
<td>• Fatigue; inability to reset or recover</td>
<td>• Rest and reset options provided and encouraged</td>
</tr>
<tr>
<td>• Diminished health</td>
<td>• Health issues addressed</td>
</tr>
<tr>
<td>• Vaccination concerns and barriers</td>
<td>• Leadership remains engaged and communicating regularly with personnel</td>
</tr>
</tbody>
</table>

**Response and Recovery Factors**

Climate-related disasters often result in devastating damage to infrastructure. Severe home damage can result in prolonged or permanent displacement, considerable physical and emotional energy managing the consequences of the damage, and increased risk for adverse mental health outcomes. Graham and colleagues surveyed over 7,000 citizens of England about their experiences of the unprecedented floods of 2013-2014. They found that property damage independently predicted increased risk for mental disorders with females, younger adults, and those of lower socioeconomic status having worse outcomes. Exposure to extreme climate-related disasters, like hurricanes, increase risk for personal injury as well as property damage. A study following Hurricane Sandy found that individuals with both increased person and property exposure to the hurricane had higher rates of PTSD and these rates were more likely to persist over time.

Displacement from a community following a disaster increases the risk of negative mental health effects. In addition to the abrupt requirement to find a new temporary or permanent home, displacements can negatively impact the experience of community cohesion and social support. It also requires an individual or family to navigate a range of new life stressors (shopping, eating, relationships with neighbors) in an environment not of their choosing at a time when they may also be contending with financial stressors, health problems, and feelings of loss for their previous home and community. A
A qualitative study of community residents affected by the St. John’s River flood in New Brunswick, Canada, in 2018 found that those who were displaced had significantly worse mental health effects when compared to those who were not displaced.66 Like the study by Graham and colleagues, they found that property damage similarly exacerbated mental health concerns. Fussell and Lowe studied those displaced following Hurricane Katrina, comparing profiles of those in various states of displacement (displaced but returned, displaced and relocated, and displaced in unstable housing) and found that, compared to those who returned, those who did not have significantly higher levels of perceived stress and those who relocated to another community also had higher general psychological distress.67

Social support is one of the most significant predictors of outcomes following disasters, across cultures and around the world.68 The perception of having support from social systems, whereby a person feels that others provide them with resources and assistance in times of difficulty, creates an important buffer during response and recovery from a climate-related disaster. In addition to lowering the risk for adverse mental health effects, the presence of social support has been shown to enhance positive outcomes. In a study of Louisiana residents after the 2016 floods, those who reported higher levels of social support also indicated greater post-traumatic growth.69 Herberman Mash and colleagues studied the impact of repeated hurricane exposure on Florida Department of Health workers and found that those with higher levels of social support reported significantly improved recovery time after the events.70 These findings reveal new and critical areas for disaster planning and response, as they indicate that social support is not only associated with psychological outcomes following climate-related disasters, but also key indicators of operational sustainment and community function.

**Key Points of Risk and Resilience in Disasters:**

1. Understanding various aspects of risk in a disaster, how it changes over time, and groups that are disproportionately at risk for adverse effects are important for disaster planning and response to optimize support and interventions.

2. Identifying individuals with elevated risk in the pre-disaster timeframe, mitigating the adverse effects of disaster impact, as well as factors that emerge during response and recovery, enhances well-being, fosters community resilience, and optimizes functioning.

3. Risk should be evaluated broadly with ongoing health surveillance among different communities and sectors of society informing where risk is concentrated to provide timely and tailored interventions.

4. Individuals with multiple risk factors (e.g., a child separated from a caregiver who is displaced from a home that was damaged, disaster responder with active mental health symptoms with repeated exposure to human remains) are at significantly increased risk. Identifying them early and providing timely and tailored interventions improves outcomes.

**Interventions to Foster Community Recovery**

Community well-being and functioning in disasters are optimized through public mental health interventions, including health education, risk and crisis communication, and leadership actions.71 Early, effective, sustained interventions following disasters promote recovery and optimize community
functioning. Many people will never come for formal mental health care, nor will most people exposed to a disaster need these services. Consequently, in addition to assessment and treatment for disorders, approaches should emphasize wellness, protective health behaviors, and lowering barriers to care through interventions that capitalize on existing community resources that are often most approachable for the public. Evidence-based interventions focus on reducing distress, enhancing well-being, and optimizing social and occupational function by enhancing the five essential elements of safety, calming, social connectedness, self- and community-efficacy, and hope. These five elements collectively form the basis of Psychological First Aid (PFA, which will be discussed further later in this article) and an evidence-informed framework for supporting the mental health of individuals and communities after disasters.

The rest of this paper will focus primarily on interventions that foster PFA with an emphasis on issues relevant to public mental health. The scope and scale of disasters require public mental health interventions that focus on wellness and prevention, can be delivered at scale, and are easily utilized by a range of individuals involved in and impacted by any given climate-related disaster, including families, healthcare workers, first responders, emergency workers, and community leaders. Some people may ultimately require treatment for psychiatric disorders and further discussion of evidence-based treatment can be found elsewhere.

The Stress Continuum, adapted from the military’s Combat and Operational Stress Control framework, is a valuable tool when considering interventions (Figure 4). It depicts the range of effects that stress creates, and which resources are most useful in addressing challenges across that continuum. For healthcare systems often trained to think of individuals dichotomously as either sick or well, the Stress Continuum is a reminder that the responses most people have to stress would not in most cases rise to the level of mental illness and do not require clinical care. Establishing interventions that address the continuum of needs using a range of resources including self-help, peer support, organizational policies and procedures, and leadership actions, and, when needed, referral to healthcare for additional assessment, is important to protect mental health and foster resilience.

**Figure 4: Stress Continuum Model**

<table>
<thead>
<tr>
<th>READY</th>
<th>REACTING</th>
<th>INJURED</th>
<th>ILL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DEFINITION</strong></td>
<td>Adaptive coping</td>
<td>Mild and transient distress or loss of function</td>
<td>More severe and persistent distress or loss of function</td>
</tr>
<tr>
<td><strong>FEATURES</strong></td>
<td>In control</td>
<td>Irritable, angry</td>
<td>Trauma</td>
</tr>
<tr>
<td></td>
<td>Calm and steady</td>
<td>Worrying</td>
<td>Fatigue</td>
</tr>
<tr>
<td></td>
<td>Getting the job done</td>
<td>Cutting corners</td>
<td>Grief</td>
</tr>
<tr>
<td></td>
<td>Playing</td>
<td>Poor sleep</td>
<td>Moral injury</td>
</tr>
<tr>
<td></td>
<td>Sense of humor</td>
<td>Poor mental focus</td>
<td>Social isolation</td>
</tr>
<tr>
<td></td>
<td>Sleeping enough</td>
<td>Too loud and hyperactive</td>
<td>Loss of control</td>
</tr>
<tr>
<td></td>
<td>Ethical and moral behavior</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Self Help | Leadership/Organizational Support | Peer Support | Screening/Referral

Psychological First Aid

The five essential elements that reduce distress, improve well-being, and enhance functioning after disasters include promoting an increased sense of safety, calming, self and community-efficacy, social connectedness, and hope or optimism. These form the basis of PFA. Enhancing these essential elements through community interventions that emphasize wellness and prevention are optimal following climate-related and other disasters. Disaster workers and leaders can support victims with practical actions in the post-disaster environment (Table 5).

Table 5: PFA Actions for Workers and Leaders to Support Disaster Survivors

<table>
<thead>
<tr>
<th>Essential Elements</th>
<th>PFA Action to Support Disaster Survivors</th>
</tr>
</thead>
</table>
| **Safety**         | • Ensure immediate physical safety by removing hazards whenever possible.  
                     • Provide updated information on safety of loved ones.  
                     • Disseminate timely and ongoing information about threat level and relief efforts. |
| **Calming**        | • Provide education and normalize common psychological responses to disasters.  
                     • Help people use their existing calming strategies and teach new ones if needed.  
                     • Conduct “walking rounds” at evacuation centers to provide information and reassurance.  
                     • Encourage limiting of media exposure to reduce arousal and distorted threat perception. |
| **Efficacy**       | • Help survivors identify adaptive responses and use them.  
                     • Facilitate connection to needed information and resources.  
                     • Encourage self-advocacy and self-care to remind people of their abilities.  
                     • Encourage community input in activities to recognize losses and promote recovery. |
| **Connectedness**  | • Facilitate survivors’ communication with loved ones and existing support networks.  
                     • Encourage informal support networks in evacuation centers and shelters.  
                     • Collaborate with other disaster workers to establish unified recovery plans. |
| **Hope**           | • Emphasize survivors’ strengths and ability to recover from previous challenges.  
                     • Establish routines and activities that create some elements of “normal”.  
                     • Identify the community as resilient and promote a vision of recovery. |

Evidence-based resources that are freely available, easy to read, and highly actionable can aid families, healthcare workers, first responders, and emergency workers, as well as supervisors and leaders in knowing what steps to take, and some to avoid, to foster resilience and recovery. The organizations below have well-established resources to support stakeholders following different disaster events:

- National Child Traumatic Stress Network - [https://www.nctsn.org/what-is-child-trauma/trauma-types/disasters](https://www.nctsn.org/what-is-child-trauma/trauma-types/disasters)
- Substance Abuse and Mental Health Services Administration - [https://www.samhsa.gov/resource-search/dbhis](https://www.samhsa.gov/resource-search/dbhis)
Mobile resources and web-based training in PFA can help healthcare personnel enhance their skills in trauma response. The National Child Traumatic Stress Network has free online PFA training that can aid healthcare professionals, responders, and community members to better support themselves and others after a disaster.\textsuperscript{75} The National Association of County and City Health Officials has an online PFA training designed specifically for supervisors and leaders to help them address the unique challenges of supporting a workforce or other community in disaster response and recovery.\textsuperscript{76}

Adapting evidence-based interventions from other professions can facilitate rapid implementation of strategies to protect mental health and foster resilience in climate-related and other disasters to promote worker sustainment through actions by individuals, organizations, and leaders (Table 6). For instance, during the COVID-19 pandemic, healthcare workers experienced extreme and prolonged stressors including ongoing threats to safety for themselves and their family, shortages of protective equipment, constantly evolving health guidance, exposure to death and human remains, and the moral distress of rationing care because of resource scarcity. A range of evidence-based interventions was adapted from other high-risk occupations for use within healthcare systems to protect the mental health of workers during the pandemic.\textsuperscript{77} These actions all foster the essential elements of PFA and can be used to enhance organizational sustainment and well-being in climate-related and other disasters.

Table 6: Actions to Promote Individual and Organizational Sustainment during Disasters

<table>
<thead>
<tr>
<th>INDIVIDUAL</th>
<th>ORGANIZATIONAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>\textit{Be Prepared}. Having a plan and supplies is calming and lowers stress.</td>
<td>\textit{Education}. Understand normal psychological and behavioral responses to stress.</td>
</tr>
<tr>
<td>\textit{Media Use}. Limiting exposure to disaster related and other negative media lowers distress.</td>
<td>\textit{Training}. Thorough and realistic training to prepare workers lowers uncertainty.</td>
</tr>
<tr>
<td>\textit{Self-Care}. Sleep, nutrition, hydration, and exercise help with decision-making.</td>
<td>\textit{Communication}. Timely, regular, updated, accurate messages build trust.</td>
</tr>
<tr>
<td>\textit{Self-Monitoring}. Taking our own “pulse” through self-checks and feedback from others.</td>
<td>\textit{Camaraderie}. Connections among personnel (colleagues, managers, neighbors, others).</td>
</tr>
<tr>
<td>\textit{Self-Advocacy}. Speaking up when things don’t seem right improves efficacy.</td>
<td>\textit{Practical Supports}. Meeting basic needs for food, clothing, and shelter are essential.</td>
</tr>
<tr>
<td>\textit{Social Support}. Reaching out and connecting with others enhances connections.</td>
<td>\textit{Equipment}. Adequate supplies of needed equipment to feel safer.</td>
</tr>
<tr>
<td>\textit{Peer Support}. Peer “buddies” and other support systems to feel safe and prevent isolation.</td>
<td>\textit{Peer Support}. Peer “buddies” and other support systems to feel safe and prevent isolation.</td>
</tr>
<tr>
<td>\textit{Embedded Mental Health}. Clinical team peers encourage self-care and self-advocacy.</td>
<td>\textit{Reintegration}. Aid in challenges of returning from the “hot zone” back to routine activities.</td>
</tr>
<tr>
<td>\textit{Growth Mindset}. Team learning and growing together through difficulties.</td>
<td>\textit{Growth Mindset}. Team learning and growing together through difficulties.</td>
</tr>
</tbody>
</table>

Psychological debriefings, often referred to as “critical incident stress debriefings”, are a central element of “Critical Incident Stress Management” and still utilized in some settings with the goal of reducing adverse outcomes. However, most research indicates that debriefings following exposure to trauma do
not prevent disorders like PTSD. These debriefings should generally be avoided, particularly for groups that do not work and train together and those who experience varying levels of trauma exposure during a disaster. In the latter, the aspect of debriefings that involves sharing about ones’ trauma exposure from the event may have the unintended consequence of individuals with high exposure transmitting the distress of their experiences to individuals with low exposure. Psychoeducation, normalizing of reactions, ensuring access to helping resources, and reducing barriers to care are more preferred methods of optimizing recovery following disasters.

Leadership in Disasters

Research on the impact of leadership in disasters has primarily been conducted in the context of human-generated events, such as terrorism and war, and examined the impact of leadership behaviors on workplace communities. The impact of leadership behavior on workers’ stress is well established, with leaders serving to either exacerbate or buffer against the effects of stress in the workplace. Increasingly, research has focused on various domains of leadership, such as leadership behaviors to foster a sense of purpose, improved sleep, or posttraumatic growth with empirical evidence revealing a range of leadership behaviors associated with improved psychological health and operational sustainment among workers (Table 7). Several leadership behaviors will subsequently be discussed in additional detail.

Table 7: Leadership Behaviors to Foster Sustainment and Recovery in Disasters

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be Present</td>
<td>Listen and connect; provide resources, support, and encouragement.</td>
</tr>
<tr>
<td>Ensure Preparedness</td>
<td>Provide training for exposures and common psychological responses.</td>
</tr>
<tr>
<td>Communicate Effectively</td>
<td>Using proven strategies builds trust and optimizes behaviors.</td>
</tr>
<tr>
<td>Foster Cohesion</td>
<td>Create time for team connection, discourage gossip and scapegoating.</td>
</tr>
<tr>
<td>Optimize Sustainment</td>
<td>Meet basic needs for food and sleep, create peer buddy systems.</td>
</tr>
<tr>
<td>Model Self-Care</td>
<td>Enhances performance and gives permission for others to do the same.</td>
</tr>
<tr>
<td>Lead by Example</td>
<td>Gives permission and encourages others to do the same.</td>
</tr>
<tr>
<td>Normalize Reactions</td>
<td>Talk openly about common responses, normalize different expressions.</td>
</tr>
<tr>
<td>Prevent Moral Injury</td>
<td>Correct distorted thoughts and create a culture of learning together.</td>
</tr>
<tr>
<td>Facilitate Help-Seeking</td>
<td>Share helping resources and openly encourage their use.</td>
</tr>
<tr>
<td>Help Regulate Emotions</td>
<td>Validate feelings, direct them appropriately, model acceptance.</td>
</tr>
<tr>
<td>Foster Meaning &amp; Purpose</td>
<td>Tell people work is valued, remind them of their purpose.</td>
</tr>
<tr>
<td>Think Forward</td>
<td>Be realistic about challenges, but hopeful about the future and success.</td>
</tr>
<tr>
<td>Grief Leadership</td>
<td>Acknowledge grief, honor losses, and make meaning to foster hope.</td>
</tr>
</tbody>
</table>

Birkeland and colleagues observed that leadership viewed as supportive or empowering was associated with significantly lower psychological distress for workers following the 2011 Oslo Ministerial bombings. Leaders in the U.S. Army were randomly assigned to education on behaviors to foster improved sleep for soldiers and those who received training had unit members who reported getting more sleep, but also the leaders who received training indicated getting more sleep as well. Another study in the U.S. Army by Woods and colleagues examined the extent to which posttraumatic growth leadership impacted the well-being and functioning of soldiers and found that in units with leaders who
fostered a greater sense of growth after traumatic events, unit members had lower rates of PTSD and depression and reported high levels of unit cohesion.\textsuperscript{82} In addition to a growing empirical evidence base, the experiences of senior disaster managers demonstrate that leader behaviors have a significant impact on the recovery of communities and organizations following a broad range of disaster events.\textsuperscript{83}

Leadership self-care is critical in disasters. Ensuring adequate sleep, nutrition, hydration, work-home balance, and stress management protects the mental health of leaders and serves as a role model encouraging similar behavior throughout the workforce. Ongoing self-care protects against mental and physical exhaustion and can prevent compassion fatigue and burnout. Part of self-care involves finding peers with whom to talk, vent, and get advice and support. A formal or informal support network among leader peers can enhance well-being and sustainment, enhance learning, and improve overall disaster response and recovery efforts.

Ongoing communication by leaders using established principles of risk and crisis communication (see next section) enhances trust and engagement in protective health behaviors within a workforce or other community. It’s ideal to remember that “people want to know that you care before they care what you know.” Communication marked by active listening, empathy, support, and a desire to help reduces community fear and isolation. Effective communication by leaders can serve as an important initial source of support to individuals impacted by disasters, a critical element in reducing distress and promoting recovery. Accurate and ongoing appraisal of threats, reminding people of normal reactions, elaborating on steps being taken to mitigate risk and protect community members are additional important aspects of leadership communication.

Grief is one of the most universal experiences following a disaster. Grief can occur of course over the loss of human lives, but also over the loss of tangible items such as home, possessions, and cherished mementos, as well as loss of a sense of safety and certainty in the world. Leaders must address inevitable aspects of community grief following disasters, for those directly impacted as well as the broader community. Grief leadership involves open and ongoing communication that recognizes and gives voice to what has been lost following traumatic events. It also entails working with community members to create mechanisms for honoring grief in ways that cultivates a sense of meaning and, eventually, help people to look hopefully toward the future.\textsuperscript{84}

Leaders exist at many levels, including office managers, team leaders, CEOs, and others. During disasters, leaders also emerge within communities. In 2017, Hurricane Harvey made landfall in Texas and devastated portions of the Gulf Coast, ultimately killing more than 100, displacing over 30,000 people, and causing $125 billion in damages. Jim McIngvale, known in the community as “Mattress Mack”, used his furniture store to house displaced residents, as a location for delivery and pickup of critical supplies, and as a focal point for rescue efforts.\textsuperscript{85} His leadership gave refuge to citizens in need and fostered community connections, which served as a beacon of hope. These informal leadership behaviors occur spontaneously, augmenting formal community leadership.

**Risk and Crisis Communication**

Communication is a critical public health intervention tool in anticipation of and response to disasters that serves as an important behavioral health intervention. Risk and crisis communication shape public perceptions and impact community behaviors. Effective communication during times of crisis builds
public trust, enhances participation in protective health behaviors (i.e., evacuation, shelter in place, social distancing), reduces distress, and fosters cohesion within communities. Leaders at various levels should use established principles and techniques of risk and crisis communication (Table 8) to develop initial and ongoing public health messaging. Important questions about public safety and what is being done to manage the impact of disaster for all those affected are predictable and communicators should be prepared to address these and provide ongoing updates at established intervals or more frequently if the situation dictates. When the public trusts those delivering messages, understands information provided, and believes that disaster response resources are being provided equitably, compliance with recommended public health behaviors increases.

**Table 8: Risk and Crisis Communication Actions to Promote Health Behaviors**

<table>
<thead>
<tr>
<th>Do</th>
<th>Don’t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communicate early and regularly</td>
<td>Provide false reassurance</td>
</tr>
<tr>
<td>Say what you know and don’t know</td>
<td>Give vague responses or make up answers</td>
</tr>
<tr>
<td>Commit to finding answers and then do so</td>
<td>Deflect or respond with hostility</td>
</tr>
<tr>
<td>Plan messages using trusted principles</td>
<td>Message things “on the fly” or unplanned</td>
</tr>
<tr>
<td>Use simple and understandable words</td>
<td>Insert jargon or highly technical language</td>
</tr>
<tr>
<td>Keep messages brief and focused</td>
<td>Provide extraneous and overly detailed information</td>
</tr>
</tbody>
</table>

Disasters that are protracted or which evolve over time (e.g., COVID-19 pandemic, West Coast wildfires) create unique communication requirements because the perception of risk alters as the public’s understanding of the event evolves. Perception of risk is an important determinant of community behavior. During the COVID-19 pandemic, Ning and colleagues found that citizens of China with greater knowledge about the pandemic, as well as those who use trusted sources of information, were more likely to engage in protective health behaviors such as social distancing and wearing masks.

Communication should anticipate that certain populations will have difficulty accessing or understanding traditional information messaging. Those with cognitive impairment, institutionalized individuals, persons who do not speak the majority language, as well as those with vision or hearing impairment require additional consideration in the development and delivery of messages. Methodology of delivering messages may need to shift as well as some rely on electricity, phone lines and other connections that may not be available during a disaster. Engagement with community leaders can help identify specific groups who may benefit from tailored messages to address unique needs.

Enhancing understanding of communication which increases behavior change within different communities is important to refining messaging strategies that support risk communication. Social norms messaging, which describes undesirable behaviors as uncommon and desirable behaviors and common within certain groups and communities, has increasingly been explored to improve engagement in protective health behaviors. A study of social norms messaging exposed individuals to a simulated disaster and found that individuals who received social norms messaging were 11% more likely to report actual engagement in personal disaster preparedness behaviors.
Key Points of Interventions to Foster Community Recovery:

1. The five essential elements of PFA (safety, calming, self- & community efficacy, social connectedness, and hope) form the foundation for early interventions in other disasters.

2. Effective interventions incorporate a stress continuum that extends beyond illness and addresses distress and health risk behaviors while incorporating actions that involve individuals, peers, and organizational practices.

3. The actions and words of leaders, at many different levels, will significantly impact the well-being of workers and others and influence the trajectory of recovery. Role modeling through self-care, communication, managing stress, and other established behaviors protects the mental health of community members and enhances operational sustainment.

4. Risk and crisis communication principles should inform messaging to organizations and the public to reduce community distress, inform risk perceptions, and optimize engagement in protective health behaviors.

Conclusion

Climate-related disasters are profoundly disruptive events that impact communities far beyond the geographic boundaries of the event. Psychological and behavioral responses create significant and long-lasting public mental health burden. Understanding community responses, as well as cultural and contextual factors impacting the experience of the event, optimize response and recovery efforts. While certain groups are at increased risk in all disasters, each event creates unique risks for individuals and communities. Understanding where risk is concentrated and how it changes over time, through health surveillance and other forms of assessment, allows for timely and tailored interventions to protect mental and foster resilience. Some people will eventually develop mental health disorders that benefit from formal clinical assessment and treatment. However, early and common reactions benefit from early interventions based on PFA that enhance the essential elements of safety, calming, self- and community-efficacy, social connectedness, and hope. These resilience-focused interventions improve well-being, reduce distress, enhance functioning, and may lower the risk of developing psychiatric disorders. Risk and crisis communication are important behavioral health intervention that influences perceptions of risk and shape community behaviors. When leaders role model behaviors such as self-care and stress management, they influence community behaviors, and provide focal points for helping communities address grief, make meaning of events, re-establish a sense of purpose, and move forward with a sense of hope in the future.
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