

Natural Hazards and Health Factsheets

Synthesizing the Evidence for Public Health Practitioners

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BACKGROUND

The COVID-19 pandemic emphasized the important roles that public health agencies play in disaster preparedness, response and recovery.

Information about the health impacts of specific hazards that is necessary to guide planning is often inaccessible or indigestible.

OBJECTIVE

Provide public health practitioners with information on health impacts of hazards of concern in the U.S. Pacific Northwest

METHODS

> Searched PubMed, Google Scholar, public health agency & organization websites for peer-reviewed and gray literature

Keywords used	
Wildfire smoke	Tsunami
Earthquake	Wildfire smoke exposure
Health impacts	Health effects
Social determinant	Health consequences
Disaster	Mental health
Public health policy	Resilience

> Synthesized major health impacts by hazard

> Incorporated feedback from subject matter experts who reviewed draft content

> Created four fact sheets for dissemination



The Health Effects of Earthquakes

INTRODUCTION

Earthquakes are sudden, unpredictable movements in the ground due to the earth's crust releasing energy, usually as the result of tectonic plates moving along a fault or a volcanic eruption.¹ The National Earthquake Information Center registers around 55 significant earthquakes a day worldwide.² While various factors influence the damage caused by any given earthquake, earthquakes below 5.5 on the Richter scale are unlikely to cause structural damage or injury.³ About 100 earthquakes cause noteworthy damage each year around the world.⁴ Based on over a century of records, there are typically around 16 major (M7.0+) earthquakes with the potential to cause serious damage each year.⁵

In the aftermath of an earthquake, potentially deadly hazards such as fires, floods, tsunamis*, or seiches (large waves in lakes or ponds) may occur.⁶ The World Health Organization estimates that earthquakes were responsible for over half of all deaths related to natural hazards globally between 1998 and 2017 (about 750,000 deaths).¹ During that same time, over 125 million people were displaced, made homeless, evacuated, or injured by the initial impacts of earthquakes.⁴ However, the structural damage and displacement caused by earthquakes also has the potential to cause further cascading health impacts. These often-overlooked impacts last far beyond the emergency phase and produce major challenges for recovery. This factsheet provides an overview of earthquake-related health impacts, from the initial event into the recovery phase, as represented in the literature.

*To learn more about tsunami health impacts, see the "Health Impacts of Tsunamis" factsheet.

ACUTE IMPACTS

Most earthquake-related injuries and deaths are related to falling debris.⁷ Being indoors, especially in a poorly constructed building, during an earthquake is one of the greatest risk factors.⁸ Some of the most common earthquake-related injuries are fractures,⁹ crush injury,¹⁰ penetrating and soft wounds,¹¹ and traumatic brain injury.⁷ Other risks include drowning due to dam breakage or water displacement, hypothermia, and exposure to toxic dust, smoke, or waste.⁷ People who are young or very old, have an injury or illness, or a physical disability are at higher risk.⁸

Wound infection is common and, if left untreated, can be deadly.⁷ Many wounded people develop polymicrobial infections due to fungi and atypical bacteria, and those who develop sepsis are more likely to die.⁷ Infection rates tend to be highest in areas where patients are cut off from medical attention due to their remote location and damaged transit or healthcare systems.⁸ Injured people may require significant rehabilitation, especially those with complex injuries or those whose injuries result in long-term or permanent disabilities.¹²

EARTHQUAKES



The Health Effects of Tsunamis

INTRODUCTION

A tsunami is an unpredictable series of large waves that occur when a substantial volume of water is suddenly displaced on the seafloor or lakebed, usually after an earthquake or landslide.^{1,2} Volcanoes, near-earth object collisions, and some weather events can also cause a tsunami.^{1,2} Tsunami waves radiate out from their point of origin, traveling at speeds of over 500 mph in the deep ocean and at 20-30 mph on land.³ They can inflict damage on coastal areas thousands of miles away.^{1,2} Coastal communities near the origin of the tsunami are the most vulnerable, and may be repeatedly flooded by waves that cause widespread inundation with little to no warning. Waves from a large tsunami could occur every 10-45 minutes for several hours, and increased currents can last for days.^{1,2} Globally, tsunamis cause damage or deaths near their source approximately twice per year, and in distant coastal areas, approximately twice per decade.²

Although relatively rare, tsunamis can be highly damaging events. Of the over 250,000 tsunami-related deaths between 1998 and 2017, around 90% occurred during the 2004 Aceh Tsunami.¹ Tsunamis are of increasing concern due to the growth in coastal populations, increased potential in damaging tsunami flooding due to sea level rise, and the co-occurrence of tsunamis with other hazards.² This factsheet provides an overview of tsunami-related health impacts, from the initial event into the recovery phase, as represented in the current literature. It should be noted that, given the rarity of major tsunamis, much of the literature is based on a few events.

TSUNAMIS



The Health Effects of Wildfire Smoke

INTRODUCTION

The Western United States has seen rapid increases in the length of its fire season, the number of annual fires, and the amount of land burned by wildfires over the last few decades.¹ This trend is expected to continue in the future.² While the fires themselves are a major hazard, exposure to wildfire smoke is also a serious public health concern.

Wildfire smoke contains tiny, partially-combusted particles—those 10 micrometers (µm) in diameter (PM10) or smaller can enter the lungs through the nose or throat, causing irritation or long-term damage.³ The most dangerous are the smaller particles (PM2.5 or smaller) which can enter the bloodstream.⁴ PM2.5 exposure from all sources is a significant environmental risk factor for human health effects across the globe.⁴

Smoke from wildfires can travel long distances and increase PM2.5 levels in the air far from the source.⁵ During wildfire events, the average indoor concentration of PM2.5 has been shown to nearly triple, even with measures taken to reduce infiltration from outside air.⁶ Under high-emissions scenarios, wildfire smoke could be the primary source of global PM2.5 exposure as early as 2100.⁷ It is vitally important to understand how wildfire smoke affects human health. This factsheet provides an overview of the health impacts of wildfire smoke exposure as represented in the current literature.

VULNERABLE POPULATIONS

In addition to the increasing severity of wildfire seasons, our expanding wildland-urban interface (where human settlement runs up against undeveloped land) is increasing the number of communities at risk.⁸ Those most vulnerable to wildfires are those with existing chronic conditions (particularly heart or lung disease), such as asthma, chronic obstructive pulmonary disease (COPD), emphysema, heart failure, angina, or ischemic heart disease.^{7,8,17} Women with asthma and COPD tend to be more severely impacted than men.^{8,19} Finally, older adults, young children, teenagers, pregnant women, and individuals of low socioeconomic status have all been shown to be at increased risk of smoke exposure and/or associated health impacts.^{14,15,18}

WILDFIRE SMOKE



The Mental Health Effects of Natural Hazards

INTRODUCTION

Each year, over 200 million people are impacted by disasters.¹ Those exposed to disasters may be at risk of physical, mental, and behavioral health impacts. Disasters have been linked to an increased burden of mental and behavioral disorders in affected communities. Research suggests that anywhere from one third to one half of those exposed to disasters could develop mental distress (such as post-traumatic stress disorder (PTSD), depression, or anxiety disorders).²⁻⁴ Estimates show that 5-10% of all survivors will need significant clinical care.⁵ While most survivors recover from mental and behavioral health impacts within the weeks following the disaster, some may have symptoms months and even years after the disaster.^{2,3} This factsheet provides an overview of disaster-related mental health impacts from the current literature.

CULTURAL CONTEXT

Much of the research on the mental and behavioral health impacts of disasters uses Western frameworks, diagnostic tools, and interpretations. The literature thus may misrepresent the morbidity, sequelae, and healing/coping mechanisms related to mental distress in non-Western contexts.

- Mental disorders like PTSD and depression may manifest differently across cultures. Not accounting for cultural differences might lead to flawed or unproductive research and treatment processes.¹⁵
- Diagnostic tools may not be culturally sensitive, leading to potential misinterpretation or under-estimation of mental distress.³
- Stigma can cause people to hide their illness and potentially seek treatment outside of "professional" healthcare settings, such as religious or traditional healers.⁶

MENTAL HEALTH