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.[2] 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 population growth in coastal communities, increased potential for 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.

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Acute Impacts

Tsunami waves are powerful enough to transport debris at high speeds and sweep people into objects and buildings, which can cause injuries and deaths.[3] Drowning is the most common cause of tsunami mortality.[1,3,4] Common tsunami-related injuries are crush injuries,[1,3,5] fractures (particularly open fractures),[1,5] and near-drowning/aspiration.[5] The seawater in tsunamis can carry bacteria, pathogenic fungus, and other infectious agents; these biological hazards remain in the floodwaters after the waves.[3,6] Open wounds are at a high risk of infection, primarily from gram-negative bacteria.[3,6] Those who suffer near-drowning may experience aspiration pneumonia from contact with contaminated water.[3] Contact with the floodwaters can cause or worsen dermatological conditions.[6]

Indirect Impacts

Tsunami-related flooding has not been shown to cause infectious disease epidemics.[3,7] Rather, tsunami floodwaters are more strongly associated with environmental contamination and degradation. Floodwaters can contaminate water and food supplies[8] and spread pathogenic biological contaminants (particularly from sewage) such as fungi, protozoa, and bacteria into areas where they were not previously found.[6]

Tsunamis can transport chemical contaminants into environments not previously exposed, both in the floodwaters and the sludge left behind.[9,10] Chemicals like heavy metals that have accumulated in the sludge in harbor floors and coastal rivers can be brought ashore.[10] Infrastructure damage due to waves and debris flow can also release or spread additional contaminants like industrial chemicals, gas, fertilizers, and pesticides.[10,11] Contaminants may spread to unexpected areas and can persist in the environment.[10]

Mental Health*

Tsunamis, like other disasters, can impact the mental health of those affected.* Increased rates of PTSD,[12] anxiety,[13] stress,[12] depression,[13] and sleep disorders[13] can occur or worsen among tsunami-affected populations, though these impacts may decline in the years after the tsunami.[14] Children, women, and those with existing mental health concerns are especially vulnerable to these mental health impacts.[12,13]

*For more on the mental health impacts of disasters, see "Mental Health Impacts of Natural Hazards" factsheet

Infrastructure/ Health Care Impacts

Health-related infrastructure may also be damaged or lost in the aftermath of a tsunami. The tsunami may damage or destroy health-care facilities, equipment, and records, as well as kill or injure health-care workers.[15] Subsequent fears of disease outbreaks and the number of dead bodies from large events can impose severe psychological stress on health-care workers.[15] Disruption to infrastructure like roads, fuel and power supplies, and telecommunications equipment can all reduce response capacity and decrease health care access.[11,15]

Displacement-Related Impacts

People displaced by the tsunami can end up living in shelters and camps for months or years, and may face additional health risks. Although tsunamis themselves are not associated with infectious disease outbreaks, poor sanitary conditions, contaminated water and food, and overcrowding in camps or shelters may help spread communicable diseases such as respiratory infections and food and water-borne illness.[7,16] Shelters may also expose people to chemical contaminants, such as asbestos.[10] Lifestyle changes while living in temporary housing may also lead to weight gain.[17] Some evacuees who had to sleep on the floor in crowded, cold conditions developed chronic conditions like disuse syndrome.[9]

Rebuilding in tsunami-affected areas is not always equitable. A sizable proportion of displaced persons tend not to return to their pre-disaster place of residence; instead, lower-income individuals may move in.[18]This has the dual effect of increasing housing burden inland and transferring hazard vulnerability onto a lower-income population.[18]

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This material is based upon work supported by the National Science Foundation (NSF) under Awards #2103713 and #1940034. Additional support was provided by grant #P30ES0070 from the National Institute of Environmental Health Sciences (NIEHS). Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the NSF or NIEHS.

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Last updated 7/2023