



# 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.<sup>1</sup> The National Earthquake Information Center registers around 55 significant earthquakes a day worldwide.<sup>2</sup> 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.<sup>3</sup> **About 100 earthquakes cause noteworthy damage each year around the world.**<sup>4</sup> 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.**<sup>2</sup>

In the aftermath of an earthquake, potentially deadly hazards such as fires, floods, tsunamis\*, or seiches (large waves in lakes or ponds) may occur.<sup>4</sup> **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).<sup>1</sup> During that same time, over 125 million people were displaced, made homeless, evacuated, or injured by the initial impacts of earthquakes.<sup>1</sup> 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.<sup>5</sup> Being indoors, especially in a poorly constructed building, during an earthquake is one of the greatest risk factors.<sup>6</sup> Some of the most common earthquake-related injuries are fractures,<sup>7,8</sup> crush injury,<sup>7,8</sup> penetrating and soft wounds,<sup>7,8</sup> and traumatic brain injury.<sup>7</sup> Other risks include drowning due to dam breakage or water displacement, hypothermia, and exposure to toxic dust, smoke, or waste.<sup>5</sup> People who are young or very old, have an injury or illness, or a physical disability are at higher risk.<sup>6</sup>

**Wound infection is common and, if left untreated, can be deadly.**<sup>7</sup> Many wounded people develop polymicrobial infections due to fungi and atypical bacteria, and those who develop sepsis are more likely to die.<sup>7</sup> **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 health-care systems.<sup>8</sup> Injured people may require significant rehabilitation, especially those with complex injuries or those whose injuries result in long-term or permanent disabilities.<sup>9,10</sup>

# Indirect Impacts

Earthquakes may result in medium- and long-term health impacts, especially for those with chronic conditions. Lifestyle changes such as changes in diet and normal routines, in addition to the stress of the disaster and lack of access to supplies, can contribute to higher rates of diabetes among those exposed.<sup>11,12</sup>

A public health system can become overwhelmed after an earthquake, leading to higher transmission rates for infectious diseases; however, epidemics are rare.<sup>7,13</sup> Mass relocation into temporary housing can exacerbate these conditions. Inadequate sanitary conditions in shared spaces can contaminate food and water, which can spread dermatological, respiratory, and gastrointestinal diseases.<sup>8</sup> Commonly reported infectious diseases after an earthquake include diarrheal diseases due to contaminated water supplies; respiratory infections from dust; malaria and other insect-borne diseases due to disrupted insect control strategies; tetanus, and measles.<sup>13</sup>

Earthquakes can also expose people to environmental contaminants. The destruction of buildings increases particulate matter in the air and may cause asbestos exposure and/or smoke exposure from resulting fires.<sup>5</sup> Additionally, industrial centers may be compromised, potentially exposing victims and rescuers to toxic chemicals, gasoline, radioactive materials, natural gas, and sewage.<sup>5</sup>







## Impacts to Health Care

**Otherwise treatable health conditions are often worsened** by the strain that earthquakes put on health-care systems.<sup>14</sup> Earthquakes can overwhelm health-care systems due to the volume of patients, reduced staff, and damaged medical equipment, as well as disrupted transportation corridors, telecommunication systems, and fuel supplies.<sup>14</sup> This reduces capacity for comprehensive care, diagnostics, or emergency treatment beyond lifesaving and triage.<sup>14</sup> Small facilities like individual practices, clinics, labs, and community health centers may take a long time to return to full capacity.<sup>14</sup>

In addition to structural damage, **earthquakes can create or exacerbate existing health care staffing problems.**<sup>14</sup> Health-care workers and/or their families may be impacted by the event itself, which may affect their willingness or ability to come to work.<sup>14</sup> This may lead to insufficient ability to deliver care, potentially leading to higher rates of complications.<sup>14</sup>

Earthquakes may impact reproductive health post-disaster. In the short term after an earthquake, there have been **decreased birth weights and increased stillbirths.**<sup>10</sup> Unplanned pregnancies and total births both increase post-disaster, while inter-pregnancy intervals shorten.<sup>10</sup>

**Even those with access to post-disaster health care may struggle to afford it post-disaster,** as many businesses may permanently close, increasing unemployment.<sup>14</sup> In the U.S., where health care is often tied to employment, unemployed workers may not be able to find coverage, limiting access to care.<sup>14</sup>



## Displacement

Earthquakes can profoundly affect income and assets. Earthquakes can increase poverty rates and decrease housing, wealth, and income.<sup>16</sup>

Temporary housing may expose people to environmental contaminants and other stressors.<sup>17</sup> Sleeping on the floor for extended periods of time with inadequate heating and bedding can result in stiff muscles and hypothermia.<sup>17</sup> Those living in shelters may also encounter sanitizing chemicals used to prevent disease.<sup>18</sup>

While displaced, lifestyle changes may cause or exacerbate chronic conditions. Changes in exercise routines, sleep patterns, diet, smoking and alcohol consumption can all increase the risk of cardiovascular disease, obesity, hypertension, and diabetes.<sup>12</sup> Past earthquakes have increased mortality among elderly people displaced from assisted living facilities.<sup>12</sup>

## Animal Health and Food and Water Security

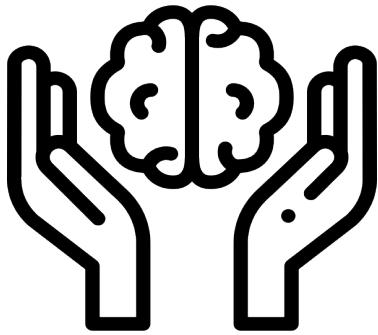
Livestock can be killed or injured by earthquakes and their aftermath. Animals are at risk of illness post-disaster and may lack sufficient veterinary care. This may result in outbreaks of zoonotic diseases.<sup>13</sup> Earthquakes may also reduce food and water security. Crop loss,<sup>13</sup> food contamination,<sup>15</sup> and the inability to treat and deliver potable water<sup>13,15</sup> can result in significant food and water shortages. These may increase the risk of foodborne and waterborne illnesses.<sup>13,15</sup>





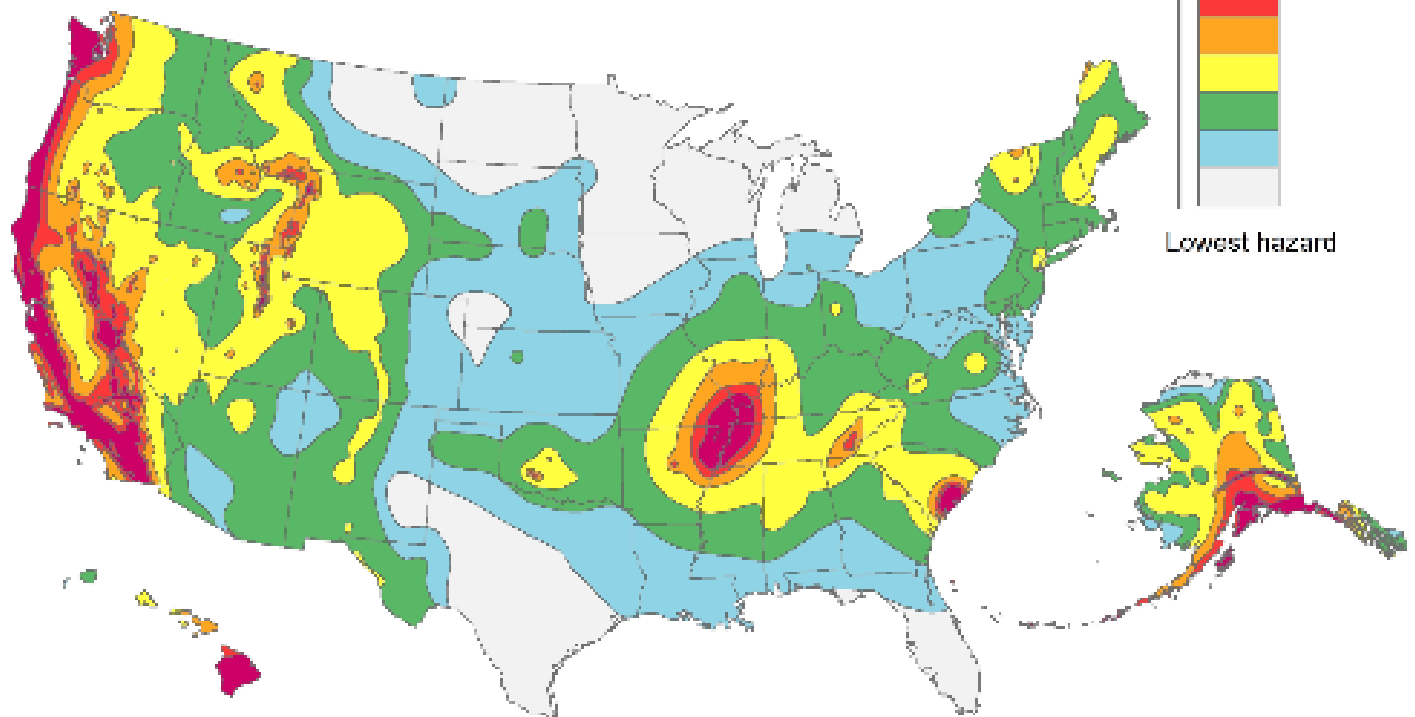


## Mental Health



Recent literature on the health impacts of earthquakes has focused heavily on mental health outcomes.\* The traumatic nature of a sudden disaster, unexpected life changes, and the loss of support networks can contribute to negative mental health outcomes.<sup>11</sup> Common initial responses to earthquakes include dissociation, emotional numbness, and a distorted sense of the passage of time, potentially followed by anxiety, post-traumatic stress disorder, stress, sleep issues, and depression.<sup>7</sup>

\*For more on the mental health impacts of earthquakes and other extreme events, see "Mental Health Effects of Natural Hazards."



*A U.S. Geological Survey map of earthquake risk across the United States representing the outputs of models based on seismicity and fault-slip rates that take into account the frequency of earthquakes of various magnitudes.*



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