

Multicasualty Incidents & Disasters



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Epidemiology of Disasters

Natural Disasters
Nonnatural Disasters
Prehospital Management of Multicasualty Incidents & Disasters

Emergency Department Disaster Management
Stress Management & Psychological Support

■ EPIDEMIOLOGY OF DISASTERS

Specific types of disasters produce different patterns and numbers of injuries and have different effects on the social and physical environment. By understanding them and anticipating their potential effects on a community, effective mitigation and preparedness may be possible.

NATURAL DISASTERS

Natural disasters are events caused by natural forces and geographical events. With the exception of war, these are historically the most common types of large-scale events (Table 4-1).

Earthquakes

An earthquake is the most likely large-scale event in the United States. Earthquake intensity is commonly measured by the Richter scale, a logarithmic scale that measures the intensity of seismic waves. An earthquake of 2.0 magnitude is barely felt, whereas an 8.0 magnitude event is greatly destructive. There have been 6 major earthquakes greater than 8.0 on the Richter scale in U.S. history (Figure 4-1). An earthquake of a given magnitude may produce varying amounts of destruction, depending on a complex interaction of many factors, including the type of ground underlying a structure, the degree of ground failure (eg, landslide, soil failures), and the construction quality of overlying structures.

Injuries are most often due to structural collapse (ie, crush injuries), falling debris, fire, and falls. Illness also occurs as a result of disruption of existing community

Table 4-1. Sudden natural disasters causing 10,000 or more deaths, 1949-1985.¹

Year	Event	Location	Approximate Death Toll
1949	Floods	China	57,000
1954	Floods	China	40,000
1960	Earthquake	Morocco	12,000
1962	Earthquake	Iran	12,000
1963	Tropical cyclone	Bangladesh	22,000
1965	Tropical cyclone	Bangladesh	17,000
1965	Tropical cyclone	Bangladesh	30,000
1965	Tropical cyclone	Bangladesh	10,000
1968	Earthquake	Iran	12,000
1970	Earthquake/avalanche	Peru	70,000
1970	Tropical cyclone	Bangladesh	250,000-500,000
1971	Tropical cyclone	India	10,000-25,000
1976	Earthquake	China	225,000-650,000
1976	Earthquake	Guatemala	24,000
1977	Tropical cyclone	India	20,000
1978	Earthquake	Iran	25,000
1985	Tropical cyclone	Bangladesh	10,000
1985	Earthquake	Mexico	10,000
1985	Volcanic eruption	Colombia	22,000

¹Reproduced, with permission, from Bernstein AG, Thompson P. The natural history of natural hazards. In: *Management of Wilderness and Environmental Emergencies*. Auerbach PS, Geier EC (editors). Mosby, 1989.

infrastructure (eg, food supply, power, sanitation, ongoing support for persons with chronic disease). Predictably, the patterns of injury seen among casualties include lacerations, contusions, fractures, head and spinal cord injuries, burns, effects of exposure, infection, and exacerbation of chronic medical problems. The speed of rescue efforts has an important bearing on the outcome (Figure 4-2).

Tropical Cyclones (Hurricanes, Typhoons, & Tropical Cyclones)

Tropical cyclones (hurricanes in the United States and Atlantic, typhoons in the eastern Pacific, tropical cyclones elsewhere) are a circulating mass of clouds, rain,

and wind around a clear central area of extreme low-barometric pressure. They occur most commonly in the late summer months.

The intensity of tropical cyclones is rated on a 5-point scale. For hurricanes approaching the United States, this information is available from the National Weather Service, which can also provide information about a storm's probable path. Damage is commonly due to high winds, which can exceed 150 mph, as well as torrential rain and high seas, which may produce flooding and soil instability (eg, landslides).

Casualties may be caused by trauma from flying debris or structural collapse; by drowning; by famine related to damaged agriculture and food distribution systems; by disease related to loss of power, water, and sanitation; and occasionally by violence related to loss of public safety. Casualties may be reduced by effective early warning systems and evacuation efforts.

Tornadoes & Severe Storms

On an annual basis, tornadoes and severe thunderstorms are the most common cause of death due to natural disasters. In the United States, approximately 100,000 severe storms (eg, involving thunder, high winds, and hail) occur each year, including 1000 tornadoes. Most commonly affected are the midwestern and southern United States, usually during the summer months, and during late afternoons. Only about 1% of all tornadoes produce injury, and most deaths occur in a small number of highly destructive events.

Casualties are related to trauma from structural collapse, flying debris, or being knocked to the ground or thrown. Head injuries, crush injuries, fractures, contusions, and lacerations are common. As with all disasters, secondary illness and injury may occur, although tornadoes most commonly tend to produce random, isolated groups of casualties wherever they touch down, rather than diffuse area-wide casualties and destruction to community infrastructure. Casualty mitigation through early warning and evacuation is hard to manage because tornadoes are difficult to predict and the time frame for evacuation or protective cover is brief.

Floods

Floods are typically seasonal and result from one of several causes: (1) excessive rains or snow melts that lead to rivers overflowing their banks in a floodplain area, (2) tsunamis (tidal waves) or hurricanes in low-lying coastal areas, (3) flash floods in flat areas where rainfall produces surface water that exceeds the runoff or absorptive capacity of the soil, or (4) failure of a dike or dam, usually due to heavy rains.

In the United States, the number of deaths each year from floods is small and sporadic. Property damage can

¹This chapter is a revision of the chapter by Charles E. Saunders, MD, FACED, FACC, from the 4th edition.