

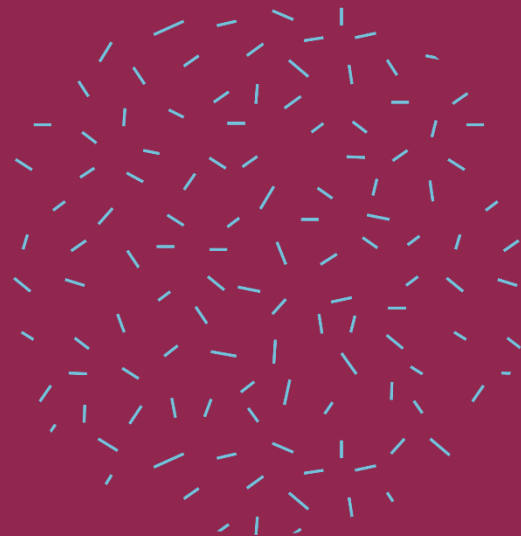


Mass Disasters Forensic Science

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Mass Disasters- Forensics

- The death of one person can be devastating not only to a family, but even to a community, and mass and serial killers may take several or many people's lives—either at once or over a period of years.
- Forensic techniques are used to solve crimes involving death, but forensic scientists are often involved in mass disasters, too.
- “Mass disaster” is a catchall term that includes natural calamities such as earthquakes, floods, volcanoes, and tsunamis—as well as man-made events such as genocides, bombings, and fires.
- Ecological disasters, such as oil spills, are also classified as mass disasters.



Mass Disasters and Fatalities

- In general, from a forensic perspective, an event called a mass disaster typically implies a large loss of human life over a relatively short span of time.
- The forensic science that is applied mainly involves examining the causes and effects of these types of devastating events—especially to figure out whether criminal charges or civil lawsuits will go before courts—and identifying the large numbers of people who can perish in these catastrophes and figuring out why they died.
- From a professional standpoint, an incident called a mass fatality is usually considered something that causes more deaths than the local law enforcement, emergency, and forensic resources can handle.



Natural Disasters

- The type of natural disaster that is the deadliest is floods. The tsunami in the Indian Ocean in 2004 caused the deaths of over 230,000 people.
- The 7.0 earthquake in Haiti in 2010 caused a loss of life nearly equal to that of the 2004 tsunami—although high poverty and poor building materials were partly responsible for the tremendous number of fatalities and the difficulties in rescuing victims.
- Other natural disasters where victims are hard to find and/or identify include cyclones and hurricanes. In 1999, mudslides that followed a massive rain in Venezuela took the lives of over 15,000 victims.
- Conversely, droughts that cause famines are other natural disasters that will leave victims emaciated but presumably identifiable. In 1932 and 1933, a famine in Russia is estimated to have killed about 5 million people. This was partly a man-made disaster, though, because Stalin controlled crops and food production, which contributed to the massive loss of life.





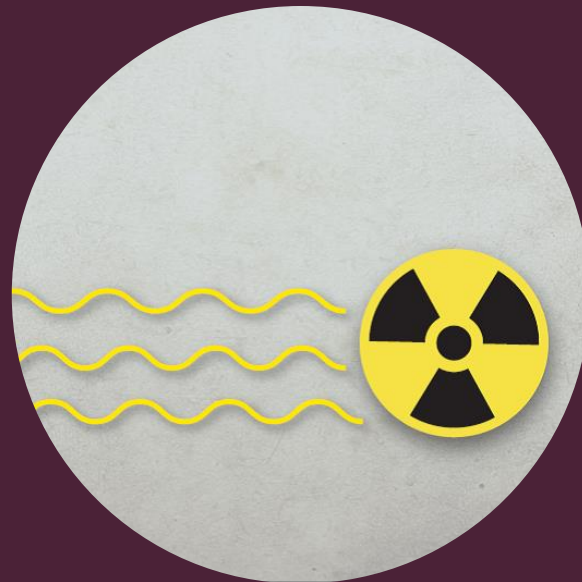
Natural Disasters Continued

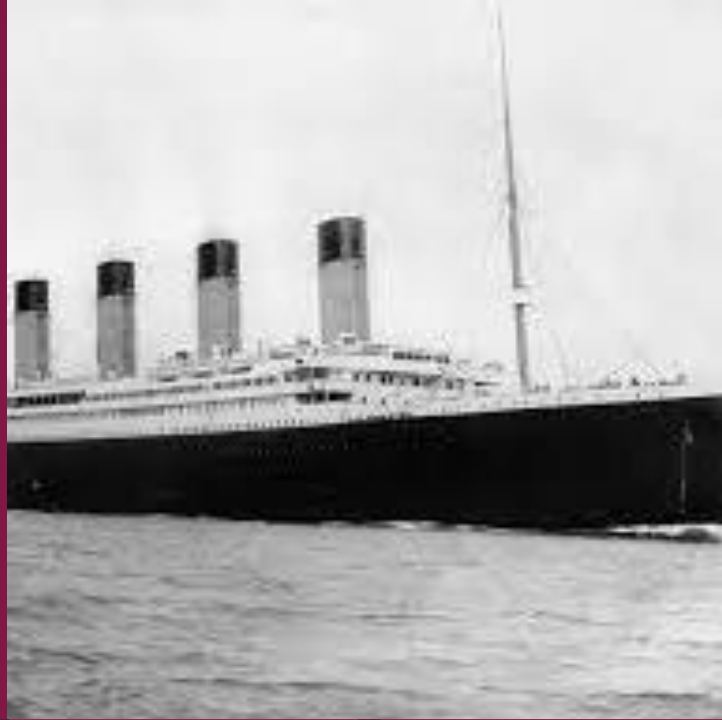
- In modern mass fatalities from natural causes, looking at engineering issues of structural collapse is important because it has the potential to lead to designs for safer buildings, dams, and bridges that might better withstand future earthquakes, hurricanes, and other unavoidable and sometimes unpredictable events.
- Floods are the deadliest type of natural disaster. It's estimated that 3,700,000 people died in a great flood in China in 1931.
- Other analytical sciences will also be involved—depending on the type of disaster—such as geologists, meteorologists, or even microbiologists if the cause is epidemic. Policies related to prevention, intervention, and emergency treatment and relief may also change based on the analyses of natural disasters.
- It's sometimes difficult to separate the natural and man-made components of many mass disasters because there are frequently overlapping issues related to building construction, politics, and population density.



Man Made Disasters

- The man-made disaster that has led to the greatest loss of life is war. World War I is estimated to have resulted in the loss of 15–65 million people, but that included deaths from the Spanish flu epidemic, which was rampant among soldiers in 1918 and 1919. World War II killed about 40–72 million people—an estimated 2% to 3% of the total world population at the time. About 5–11 million of those deaths were caused by genocide during the Holocaust.
- Other man-made disasters involve the release of toxic chemicals into the air or water from technology. The Chernobyl nuclear plant meltdown in northern Ukraine in 1986 was a serious mass disaster, in which at least 6,500,000 people were exposed to the radiation.





Man Made Disasters Continued

- Fires and explosion—both accidental and intentional—are other forms of man-made mass disasters. The deadliest man-made fire- and explosion-related mass disaster in U.S. history was the September 11, 2001, hijacking of 4 airplanes, 2 of which were flown into the World Trade Center in New York City. A third plane was taken over by passengers and went down in a field in Pennsylvania, and a fourth plane intentionally crashed into the Pentagon building by the hijackers. An estimated 2753 deaths were attributed to this coordinated act of terrorism.
- Our modes of mass transportation have certainly contributed to mass disasters. The steamboat *Sultana* exploded and sank on the Mississippi River in 1865, killing a minimum of 30 more people than the famous *Titanic*.
- As technology has advanced to include bigger planes, aircraft crashes have increased the death tolls. The worst airline accident prior to 9/11 in the United States was the 1979 crash of an American Airlines plane shortly after it took off from Chicago O'Hare International Airport and lost an engine; 273 people died in that crash.



Responding to Mass Disasters 1 of 5

- In a sense, any mass-disaster setting is a monumental crime scene, and any—if not all—of the forensic techniques and technologies that have been discussed may come into play.
- Just as with a small crime scene, there are safety and security issues for emergency personnel and other first responders, and the area involved has to be secured—to keep others from harm and to prevent looting or damage of evidence.
- Victims need to be tended to—whether injured or dead—while at the same time, proper protocols have to be used to collect any evidence that might aid the incident’s investigation. Ultimately, the site must be cleaned up and made usable again, if that’s even possible.
 - Depending on the mechanism that causes a disaster—or the particular mode of transportation that’s involved—the response will differ. The type of public place where an incident occurs—such as an airport, a football stadium, or a university—will also affect how the scene is handled.



Responding to Mass Disasters 2of5

- When a catastrophe occurs, the first thing that has to be determined is who is in charge, and you'd be surprised how complicated this can be at times. Often, politics are involved, and entities either want the responsibility for the emergency—sometimes for the prestige it brings them—or prefer to hand off the disaster to anyone who will take over.
- All geographic areas typically already have emergency management systems in place—such as police, fire, and emergency medical personnel.
- Local hospitals are made ready for impending wounded victims, and ambulance and fire companies begin to report their estimated time of arrival to transport victims. These rescuers need to have the personal protective gear and other equipment necessary to transport victims and recover the dead. They may be facing biohazards like body fluids or toxins like jet fuel and many other dangers.
- Secure communication networks have to be quickly set up that will allow only those involved to monitor the information going between police, emergency workers, and the disaster management personnel. The media also has to be managed; they can be a disaster's greatest resource at times, but can also turn into its worst nightmare.



Responding To Mass Disasters 3of5

- The necessary equipment has to be quickly procured—whether that involves heavy equipment to remove rubble, search and rescue dogs, or refrigerated trucks to store bodies until autopsy.
- There are also financial concerns, such as who is going to pay disaster workers if they aren't volunteers as well as purchase the necessary supplies.
- In addition, mass fatalities always require establishing a family assistance center. Immediately after a mass fatality is known about, people whose loved ones were on the plane or in the building that collapsed quickly descend on the area to seek news about the victims.
- Part of any emergency plan is to bring in social workers and clergy members to help the grieving. At the same time, computer operators can start to collect antemortem information about victims from the families to assist in identification—such as their appearance and available medical or dental records as well as family reference samples for DNA testing.





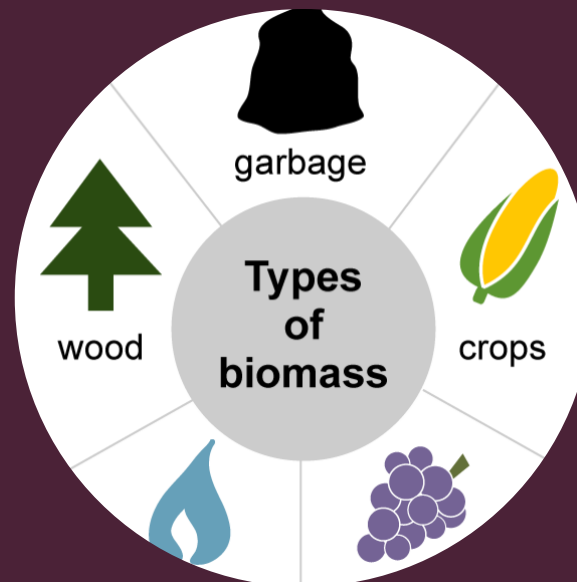
Responding to Mass Disasters 4 of 5

- If the incident is a plane crash, the airline involved will deal with public and family concerns. All airline carriers have disaster teams already in place among their staff.
- Often, the disaster management personnel will secure a nearby hotel to house the family members away from the site and to keep them from seeing or overhearing things that may be too much for them to bear.
- Because forensic science is more involved with the dead than the living in these situations, forensic scientists are the ones that deal with the morgue operations. Depending on the proximity to one or more major coroner's or medical examiner's facilities, a temporary morgue may need to be set up in the area.
- In the morgue, depending on the condition of bodies and body parts that come in, autopsies are conducted to establish cause of death and to gather particulars that will assist in identification, such as tattoos or dental work.
- The psychological needs of disaster workers have to also be addressed. The things that they see, hear, and smell can be horrific, and even the most experienced morgue workers can be challenged in a mass-disaster setting.



Responding to Mass Disasters 5of5

- Investigating the cause of a disaster might require the expertise of forensic engineers, accident reconstruction experts, fire and explosives investigators, or others—depending on the incident. Figuring out what happened can also involve black-box data recorders or surveillance equipment that may hold information.
- Away from the site, the investigation could also employ high-tech analyses of digital and financial data, particularly if the cause may have been terrorism. Passenger or building occupant lists may need to be accessed to figure out who the victims are likely to be and how many may still be missing. Establishing fault, or potential safety violations that led to the disaster, will have legal implications.
- Cleaning up the site can be a massive and hazardous operation that can take weeks, months, years, or even longer—depending on the extent of the property or environmental damage. Decisions will need to be made about the disposing of any remaining biomass, which is the unidentified human tissue that may be commingled with soil or other contaminants. Biomass needs to be contained, incinerated, or buried.



DMORT

- The first mass disaster that was ever handled by the Disaster Mortuary Operational Response Teams (DMORT), the United States' network of disaster and mortuary teams, happened in 1993 in Hardin, Missouri, when the Missouri River flooded its banks— displacing about 650 coffins and vaults from the Hardin Cemetery, which dated back to 1828. This was an unusual mass disaster because the victims were already dead and buried—as known individuals—but due to the flood, they were scattered as unknown individuals for miles after the waters receded.
- Amazingly, bodies were in all states of preservation when the waters receded: There were mummified remains of people from the 19th century caught up in the branches of trees, visually recognizable embalmed bodies that family members identified after recovery, and bones that were scattered throughout the county.
- It took a dedicated DMORT team of pathologists, anthropologists, and other forensic experts months to try to identify the dead all over again, and many ended up being buried in common caskets without -identification.



Thank You For
Your Attention!

- Questions and
Comments

