

# DISASTERS: IMPLICATIONS FOR PUBLIC HEALTH AND HEALTH CARE SYSTEM

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## ABSTRACT

Disasters are the tragedies of a natural or human-made hazard which poses a level of threat to life, health, property, or that negatively affects society or environment. The sources of disasters could be natural or human generated. Among the natural disasters affecting our environment include earthquake, volcanic eruption, flood tsunami, landslide, hurricanes/tropical cyclones/typhoons, lightening among others. Again, the human induced disasters plaguing the society include the following – terrorism, bombing, riots, protests, clashes, gas leakage and flaring. The impacts of disasters are numerous and devastating on both the health of the human populations and the vital infrastructure. Public health therefore views disasters in terms of what the health care providers do to the human populations within the confines of preventing, preparing for, responding to, and recovering from disasters and emergencies. Many Governments and organizations in the world have made attempts to ameliorate the suffering of humans who have been affected by disasters. This paper discusses the implications of disasters on public health and the health care system within the fundamental principles that guide the practice of public health during disasters.

**KEYWORDS:** Disasters, Impacts, Public Health.

## INTRODUCTION

Disasters have remained a recurring decimal in the events of mankind over the years and its intensity frequency appears to be increasing recently. Disasters occur when at least ten people are killed and/or 100 people or more are affected and/or an appeal for international assistance is made or a state of emergency declared. Public health services refer to the practice of promoting and protecting the health of populations using knowledge from nursing, social and public health sciences (American Public Health Association, 1996). Health care system refers to the various levels of health care delivery services such as the primary, secondary and tertiary (Egwu, 2002).

The impact of disasters on public health and health care system are devastating and numerous. Among them include: injuries, illness, death; overwhelming of medical resources and

health services; destruction of hospitals and health centres; disruption of routine health services and preventive activities with attendant increase in morbidity and mortality. Others are increase potential for communicable diseases among population and exacerbating environmental hazards; causing of generalized panic or paralyzing trauma, anxiety, depression, neurosis, and sometimes post-traumatic stress disorder (PTSD) at epidemic levels; disruption of food supply to communities leading to famine, starvation and specific micronutrient deficiencies. Moreso, there is population displacement resulting in large spontaneous or organized population epidemics of communicable diseases in both displaced and host communities as well as high refugee population (Noji, 2008). Public Health Workers/Nurses play significant roles in protecting the health and safety of communities, families, and individuals in time of disasters or emergencies.

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Since a disaster results in a vast ecological breakdown between humans and their environment, the stricken communities need extra ordinary efforts to cope with it. Therefore, the health care providers play major roles in preventing, preparing for, responding to and recovering of humans from disasters or emergencies (American Public Health Association, 1996). This paper examines concept of disasters, impacts of disasters and implications on Public Health and Health Care System.

### OBJECTIVES

The objectives of this paper are to:

- Explain the concept of disasters.
- Highlight the Impacts of disasters on the Public Health and the Health Care System and
- Discuss the Implications of Disasters on the Public Health and Health Care System in the context of public health fundamental principles of practice during disasters or emergencies.

### CONCEPT OF DISASTERS

One of the most difficult concepts in the literature is to arrive at a definition of a disaster. There have been many attempts to define disasters, but all run into the problem of either being too broad or too narrow. Having a definition of a disaster is extremely important in epidemiology for identifying which events to include or exclude from your analysis. If events are identified with a common definition, then they can also be more easily compared.

#### Definitions of Disaster

It is “an overwhelming ecological disruption occurring on a scale sufficient to require outside assistance” ... (FEMA, 2006b).

“Disasters are exceptional events which suddenly kill or injure large numbers of people” ... (Red Cross/Red Crescent, 2010).

Disaster is an unexpected natural or man-made catastrophe of substantial extent causing significant physical damage or destruction, loss of life or sometimes permanent change to the natural environment; An unforeseen event causing great loss, upset or unpleasantness of whatever kind.

In general, most disaster events are defined by the need for external assistance. Perhaps, one reason for this observation is that the disaster relief agencies are often the only organizations with comprehensive and systematic data. There should be some caution applied to data defined in this circumstance, notably, the decision on which situations require external assistance may differ by country or region. In some situations, it may be a political decision as well.

#### Sources of Disasters

The Natural and Manmade Disasters are presented below.

#### Natural Disasters

The World Disasters Report (2010) is an annual publication of the International Federation of Red Cross and Red Crescent Societies that analyses trends in natural and man-made disasters around the world, and their effects on the environment and population. The report concentrates on the devastating consequences of disease. The report in 2010 reveals the followings:

- Earthquakes (natural disasters) attracts media attention and donor funds while silent disasters such as malaria, HIV/AIDS, tuberculosis and many other communicable disease kill ten times more people;
- Infectious diseases killed a staggering 13 million; AIDS alone 300 people die every single hour;
- Infectious diseases are also the most preventable disasters.

- **Earthquake:** This is a sudden movement of the earth's crust caused by the release of stress collected along faults or by volcanic activity.



(a)



(b)

**Plate 1a and b:** Ruin of infrastructure caused by Earthquake  
**Source:** Kreimer (1989)

**Table 1: Earthquake Occurrence in the World**

Year	Location	Death Toll	Injury	Damage	Structure
1985	Mexico City	9,500	30,000–100,000	3 – 4 billion US Dollar	412 buildings collapsed 3124 buildings damaged
1990 (M 7.8)	Philippines (Luzond Island)				190+ 54 buildings were affected
1995 (M 6.8)	Great Hanshin (City of Kobe)	6,000	35,000	US\$61 – 70 billion	55,000 houses collapsed, 32,000 houses damaged in Kobe, 500,000 persons lost their houses
1999	Taiwan (Chi-Chi)	2,415	1441	US\$9.2 billion	41,336 houses damaged
2001	India (Gujarat)	15,000 – 20,000		US\$5.5 billion	50 multistory buildings collapsed
2004	Japan (Nigata-Chuetsu)	-	3,000	-	-
2004 (M 9.1)	Indian Ocean (Indonesia, Sri Lamka, India and Thailand)	1,000,000	-	-	-
2009 (M 7.5)	Indonesia (Mentawi Islands)	1,000,000	-	-	-
2010 (M 7.0)	Haiti	230,000	300,000	-	1,000,000 people homeless, 250,000 residence + 30,000 commercial buildings collapsed

**Source:** Noji (2008): Earthquake Statistics <http://neic.usgs.gov/neis/eqlists/eqstats.html>

- **VOLCANIC ERUPTION:** This is a vent in the earth's crust through which lava, steam, ashes, etc., are expelled, either continuously or at irregular intervals.



**Plate 2:** Volcanic eruption  
**Source:** Stephenson (1991)

- **FLOOD:** This is a temporary rise of the water level, as in a river or lake or along a seacoast, resulting in its spilling over and out of its natural or artificial confines onto land that is normally dry. They are usually caused by excessive runoff from precipitation or snowmelt, or by coastal storm surges or other tidal phenomena.

The deadliest floods have occurred in the following locations in the world: China, Death toll – 3,700,000 in 1931; Netherlands, Death toll – 100 in 1530; North Vietnam, Death toll – 100,000 in 1971; Thailand, Death toll – 185 in 2010. The number of people affected by floods in the world

between 1991 – 2000 stood at 1.5 billion. About two million people in Nigeria have been displaced in Northern Nigeria (Sokoto, Jigawa and Kebbi and Kogi States) by flooding. The flooding began when the gates on the Challawa and Tiga dams were opened. The dams are in Kano state, but about 5,000 villages in neighbouring Jigawa state have been affected. Flooding has been reported in other parts of Nigeria – Lagos, Ogun, some parts of Cross River and Akwa Ibom States. Currently, flood disasters are reported in the following countries: Australia, New Zealand, Sirilanka and Brazil (World Disaster Report, 2010).



(a)



(b)

**Plate 3a and b:** Flooding towns and houses  
**source:** Noji (2008)

- **TSUNAMI:** This is an unusually large sea wave produced by a seaquake or undersea volcanic eruption.



**Plate 4:** Tsunamic feature

**Source:** OAS (2000)

- **LANDSLIDE:** This is a geological phenomenon which includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flow.
- **HURICANES/TROPICAL CYCLONES/TYPHOONS:** These are winds that travel at about 74 miles/hour. These winds occur in the North Atlantic and Northeast Pacific Ocean; Southwest Indian Ocean; Northwest Pacific Ocean (Charveriat, 2008).



**Plate 5:** Hurricanes/Tropical Cyclones/Typhoons

**Source:** Charveriat (2008)

- **LIGHTENING:** This is a brilliant electric spark discharged in the atmosphere, occurring within a thundercloud, between clouds, or between a cloud and the ground.



**Plate 6:** Lightening and thunder storms

**Source:** Gunn and William (2009)

**Table 2:** Most Expensive Hurricanes (Atlantic)

<b>Rank</b>	<b>Hurricane Name</b>	<b>Year</b>	<b>Category</b>	<b>Damage (U.S.)</b>
1	Hurricane Katrina	2005	3	\$81,000,000,000
2	Hurricane Andrew	1992	5	\$26,500,000,000
3	Hurricane Wilma	2005	3	\$20,600,000,000
4	Hurricane Ike	2008	2	\$18,000,000,000
5	Hurricane Charley	2004	4	\$15,000,000,000
6	Hurricane Ivan	2004	3	\$14,200,000,000
7	Hurricane Rita	2005	3	\$11,300,000,000

**Note:** Damages are listed in US dollars and are not adjusted for inflation.

**Source:** Gebbie and Qurieshi (2002)

**Table 3: Lightening Fatalities in 2009**

No.	Date	Day	State	City	Age	Sex	Location	Activity	Victim
1	3/15	Sun	TX	Port Aransas	63	M	On beach	Walking to vehicle	Stan Grassel
2	4/25	Sat	KS	Perry	45	M	Highway	Riding motorcycle	Troy Gentzler
3	5/6	Wed	MN	St. Cloud	42	M	Back yard	Yard work	Chad Giroux
4	5/16	Sat	MS	Yazoo County	16	M	Corn field		Andrew Williams
5	6/3	Wed	CA	Fontana	40	F	Under tree	Walking to bus	Tina Marie Bond
6	6/3	Wed	VA	Fredericksburg	12	M	Ball field	Playing baseball	Chelal Matos

**Source:** Gunn and William (2009)

- **HEAT WAVES:** This is an air mass of high temperature covering an extended area and moving relatively slowly.



**Plate 7:** Heat wave feature  
**Source:** FEMA (2006b)

- **DROUGHT:** This is a long period of abnormally low rainfall, especially one that adversely affects growing or living conditions.



**Plate 8:** Drought feature of cracking soils  
**Source:** FEMA (2007)

- **FIRE:** This is a burning mass of materials. An uncontrolled fire occurring in vegetation more than 6 feet (1.8m) in height.



**Plate 9:** Bush burning by fire  
**Source:** William (2007)

**Table 4:** Top Heat Waves reported based on Number of People Killed

Disaster	Date	Killed
Italy	2003	20,089
France	2003	19,490
Spain	2003	15,090
Germany	2003	9,355
Portugal	2003	2,696
France	2006	1,388
Argentina	2010	-

**Source:** FEMA (2006b)

### MAN-MADE DISASTERS

- Man-made disasters are caused by threats having an element of human intent, negligence, or error; or involving a failure of a man-made system. Man-made hazards or disasters are sometimes referred to as anthropogenic.
- Man-made disasters include technological – caused by accident either through incompetence, faulty equipment, bad weather, or some other mishap; terrorism refers to intentional act; that is, some individual or group means to cause harm in order to further their political agenda – bombing, protest, riots, etc.
- Bhopal Disaster in India – Gas leak on December 3, 1984 – MC (Methyl Iso Cyanate), 8,000 people died, 50,000 injured. 40 tonnes of MIC leaked from Union Carbide Plant at night.

- Burning of fossil fuel, gas flaring in Niger Delta, lead poisoning in Zamfara State.
- Communal clashes such as Boje and Nsadop at Boki Local Government of Cross River State; communities in Ebonyi State.
- Destruction of Oil and Gas pipeline for release of the substances into the environment in Niger Delta of Nigeria.
- Recent bomb blasts at Abuja, Jos, Warri, Bayelsa, Burno Niger, Maidugri and Kaduna States (World Disaster Report, 2011).

### IMPACTS OF DISASTERS ON PUBLIC HEALTH AND HEALTH SYSTEM

The Impacts of disasters on public health and health care system includes the following:

- Causing of deaths, injuries, and illnesses among human populations (Siegel, 2008)
- Overwhelming of medical

- resources and health services of the state
- Destruction of hospitals, health centres and other health facilities (Siegel, 2007; in Peek-Asa *et al*, 2010)
- Disruption of routine health services in hospitals and health centres
- Disruption of preventive activities
- Increase potential for communicable diseases
- Exacerbation of environmental hazards
- Causing generalized panic or paralyzing trauma
- Provocation of increases in anxiety, depression and neuroses
- Leading to post-traumatic stress disorder (PTSD) at epidemic levels among human populations
- Disruption of food supply leading to famine and specific micronutrient deficiencies and starvation
- Causing large spontaneous or organized population movements, which may lead to increased morbidity and mortality
- Population movement may precipitate epidemics of communicable diseases in both displaced and host communities (International Nursing Coalition for Mass Casualty Education, 2003).
- Crowding of populations and overlay of refugee and host populations may lead to injuries and violence
- that guide the practice of public health during disasters or emergencies;
- Since Florence Nightingale demonstrated to the World the important role that nurses play on the front lines of responding to disasters, nurses have been playing significant roles during all phases of the disaster cycles: mitigation, preparation, response and recovery (American Nursing Association, 2006).
- The Health Care Providers (Public Health Workers and Nurses) contribute specific skills in times of disaster (Malilay, Flenders and Brogan, 2006).
- The US Department of Homeland and Security (2006) states that they have the necessary skills and competencies to develop policies and comprehensive plans, conduct and evaluate disaster response drills, exercises and training.
- They are integral members in emergency operations and command centres, in leadership and management roles as well as in the field where they provide frontline disaster health and core public health services.
- The health care providers collaborate with other experts, including Environmentalists, Epidemiologists, Laboratory Workers, Biostatisticians, Physicians, Social Workers and many others in the management of disaster victims.
- They collaborate with other emergency workers from other disciplines to enhance the emergency response infrastructure at the local, regional, state, national and global levels.
- Public Health services during disasters can involve all the nurses such as those who are retired or unemployed as well as students and volunteers to assist with disaster prevention, planning, response, recovery, training and exercises.
- The guiding principles to protect the health and safety of communities, families and individuals during disasters or emergencies are centered on Mitigation, Preparedness, Response and Recovery.

### **IMPLICATIONS OF DISASTERS ON THE PUBLIC HEALTH AND HEALTH CARE SYSTEM**

The Implications of Disasters on the Public Health and Health Care System are as follows:

- The implications of disasters on public health and the health care system are embedded in the fundamental principles

Table 5 highlights public health disaster phases and the roles and actions of the health care providers.

**Table 5:** Phases of Disaster or Emergencies Management by Public Health Providers

<b>Mitigation</b>	<ul style="list-style-type: none"> <li>• Prevent a disaster or emergency.</li> <li>• Minimize vulnerability to effects of an event.</li> <li>• Assess a group of elderly citizens for their awareness about preventing heat stroke.</li> <li>• Develop community education plan to increase awareness about preventing heat stroke.</li> <li>• Evaluate community education activities on preventing heat stroke.</li> </ul>
<b>Preparedness</b>	<ul style="list-style-type: none"> <li>• Assure capacity to respond effectively to disasters and emergencies.</li> <li>• Assess the populations at risk for special needs during a disaster.</li> <li>• Develop plans to care for special-needs populations during a disaster.</li> <li>• Conduct training, drills and exercises related to care of special-needs persons. Evaluate plans for serving populations with special needs.</li> </ul>
<b>Response</b>	<ul style="list-style-type: none"> <li>• Provide support to persons and communities affected by disasters and emergencies.</li> <li>• Serve on a response team to determine the impact and specific health needs of hurricane survivors.</li> <li>• Triage victims.</li> <li>• Develop plans to rotate staff on response teams to prevent stress and burning among responders – CISM approach.</li> <li>• Deploy staff to shelters after a hurricane, in accordance with local and/or state emergency response plans.</li> <li>• Participate in after-action reviews and/or debriefings to evaluate quality of health services provided and lessons learned.</li> </ul>
<b>Recovery</b>	<ul style="list-style-type: none"> <li>• Restore systems to functional level.</li> <li>• Serve on team to assess community assets and potential for recovery from a recent flood.</li> <li>• Collaborate with partners and community leaders to plan long-term recovery priorities after a flood.</li> <li>• Participate in restoring community services after a flood.</li> <li>• Serve on term to evaluate long-term impact on persons.</li> </ul>

**Source:** American Nurses Association (2006)

## SUMMARY/CONCLUSION

A disaster is a result of a vast ecological breakdown in the relation between humans and their environment. It can also be described as a serious or sudden event on such a scale that the stricken community that suffers it would need extraordinary efforts to cope with and often with international aid. The concept of disasters has been squarely discussed and the sources of disasters could be natural or human generated. The impacts of disasters on public health and health system include mortality and morbidity, destruction of health care infrastructure, degrading environment and population, provoking negative psychological and social behaviour, disruption of food supply, and displacement of

human populations. Public health therefore views disasters in terms of what the health care providers do to the human populations within the confines of preventing, preparing for, responding to, and recovering from disasters and emergencies. The roles and actions of the Public Health Workers/Nurses are therefore to protect the health and safety of communities, families, and individuals during disasters or emergencies.

The following recommendations are made:

- Health care professionals across the globe can help implement positive changes in the prevention and control of disasters;
- The "World Disasters Report, 2000" should be made available to all

researchers, aid workers, journalists and academic interested in aid and humanitarian action. It is a tool that provides comprehensive, up to date and expert analysis of disaster and emergency trends;

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