



Post-disaster Infections

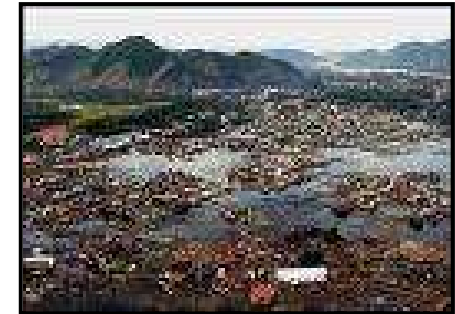
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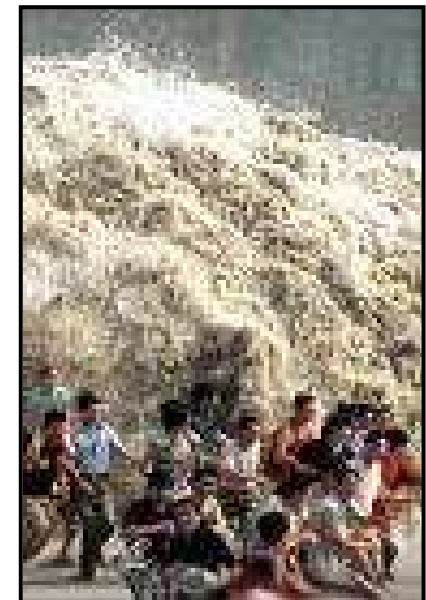
Fort Lauderdale, FL

Each year there are ~ 300 natural disasters worldwide causing nearly 250,000 deaths

In the last 20 years, natural disasters have killed ~ 3 million, and affected the lives of over 800 million



Flooding is the most common type of natural disaster worldwide



Is there an increase in infectious disease outbreaks after a disaster?

Yes

more common in developing countries

often only slightly above baseline rates that existed prior to the disaster in more developed countries

Magnitude and duration of the outbreaks are reflected by the status of the public health system in place prior to the disaster

Were vaccination programs in place?

Was primary health care available/accessible?



Factors that increase the risk of epidemics after a disaster

Large numbers of displaced populations

Temporary shelter

Crowded conditions

Inadequate sanitation (control and removal)

Inadequate waste management

Inadequate hygiene

**Compromised water sources/lack of adequate
water**

Potential food shortages and malnutrition

Reduced immunity

Loss of health care (lack of workers/programs)

Which diseases are most common after a disaster?

In the U.S.

Diarrheal diseases (Norovirus/Salmonella)

Hepatitis A

Common bacterial pathogens (MRSA/*E. coli*/
P. aeruginosa)

Rare/unusual pathogens (*V. vulnificus*)

What we don't see in the U.S.

Cholera

Plague

Which diseases are most common after a disaster?

Haiti – Earthquake 2010

Cholera

Shigella

Salmonella

Vector borne – malaria, dengue fever

Increase in preventable diseases

TB, lymphatic filariasis,



Types of Post-disaster Diseases

Diarrheal

contaminated water or food, inadequate sanitation, poor hygiene

Respiratory

aerosolization of spores, overcrowding, poor ventilation

Wound infections

walking in contaminated waters

Vectorborne

often occur weeks later

Phases of Disaster and Diseases

Impact 0 – 4 days

wound and soft tissue infections

Post-impact 4 days – 4 weeks

airborne, waterborne, foodborne

**respiratory agents will change with time –
early on viral and bacterial; later on fungal
and mold infections will predominate**

Recovery >4 weeks

vectorborne, chronic, long incubation



Factors that affect disease transmission after a disaster

Environmental factors

Endemic organisms

Population characteristics

Pre-event infrastructure and planning

Type and magnitude of disaster

Environmental Factors

Climate can affect type of disease

colder weather favors airborne diseases

**warmer weather favors waterborne and
vectorborne diseases**

Season

spring/summer – enteric viruses

**fall/winter – influenza and respiratory
illnesses**

Environmental Factors

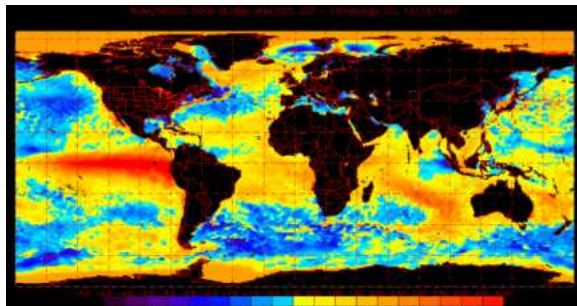
Geography

overcrowding – airborne or diseases transmitted through the fecal/oral route

Rainfall

***El Nino* years tend to result in more malaria**

Drought tends to result in malnutrition-associated illnesses – TB, measles, diarrheal



Endemic Organisms

Infectious organisms that were present in the region before the disaster will be present after the disaster

Agents that were not endemic to the region prior to the disaster, are unlikely to be present after

Rare and unusual diseases may be more common

9 fold increase in coccidioidomycosis after the earthquake in LA in 1994

outbreak of giardiasis in Red Lodge, MT after the eruption of Mt. St. Helens in 1980



Population Characteristics

**Large numbers of individuals will be displaced
crowding into shelters or refugee camps
loss of herd immunity or moving to an area
of increased susceptibility**

Health of the displaced individuals

**elderly, ill, or poor who could not evacuate
are more likely to have underlying health
conditions**

**Education of displaced individuals can affect
responsiveness to instructions and medical or
rescue teams**

Pre-event Infrastructure and Planning

How much planning and preparation was done prior to the event?

warning and evacuation

stockpiling supplies

preparing hospitals and shelters

Nutritional status of the population

Road and transportation capabilities

Sanitation status and capabilities

Magnitude and Type of Disaster

Earthquakes

crushing and penetrating injuries

contamination of water sources

Italy – 1976

5 fold increase in Salmonellosis

Philippines – 1990

significant increase in GI/diarrheal infections

Los Angeles – 1994

9 fold increase in coccidioidomycosis

Magnitude and Type of Disaster

Flooding (incl. Hurricane, Typhoon, Monsoon)

waterborne infections

vectorborne (mosquitoes)

Dominican Republic – 1979 Hurricane

28 fold increase in typhoid

10 fold increase in measles

5 fold increase in hepatitis A

Ecuador – 1983 Flood

7 fold increase in malaria

Post-Katrina Infections

Gastrointestinal - ~1000 cases in evacuees

mostly norovirus

Salmonellosis – 1 case

Non-toxigenic Cholera – 1 case

Respiratory

**1 case each of pertussis, TB, RSV,
Streptococcal pharyngitis**

MRSA

30 cases in a TX shelter

Post-Katrina Infections

Wound Infections (15 males, 3 females)

17 cases due to *Vibrio vulnificus*

1 case due to *Vibrio parahaemolyticus*

all cases were in LA or MS

6 deaths (5 male, 1 female)

13 had previous/underlying health conditions

heart disease, liver disease, DM, alcoholism

Other Examples

Myanmar – Cyclone 2008

saw a rise in schistosomiasis

numbers unclear do to lack of info sharing

not found in the U.S.



Mt. Saint Helens Eruption – 1980

9 fold increase in giardiasis in Rod Lodge,
 MT (several hundred miles away)

ash-darkened snow melted more causing
 larger runoffs creating flooding which
 contaminated the community water supply



Conflict and Infections

Displacement of extremely large numbers of individuals into refugee camps – often into bordering countries

refugees may be carrying diseases dangerous to the indigenous population

refugees may not be immune to diseases in the area to which they have fled

Flight or death of trained staff

Ongoing/recurrent periods of high risk and/or reduced security

prevents aid from reaching those who need it

Conflict and Infections

Ongoing/recurring interruptions of health care services

long-term interruption of vaccination and control programs

limited lab facilities delay confirmation

Aid and healthcare often requires help of humanitarian agencies

poor coordination between agencies

safety/inability of aid workers to respond

Lack of investment in healthcare and surveillance by governments involved in conflict

Conflict and Infections

Military and aid workers may return home with diseases seldom/never seen in their country

Crimean Congo Hemorrhagic Fever

Monkeypox

>100,000 refugees fled from Tajikistan into Afghanistan between '92-'93

when they returned to Tajikistan in '94, they reintroduced *Plasmodium falciparum* into the country (it had been eliminated since 1960s)

Post-war Kosovo ('99-'00) saw a rise in tularemia cases due to increased rodent populations

Conflict and Infections

**Examples of diseases found in U.S. soldiers
returning from areas of conflict**

Viet Nam – malaria

Somalia – malaira

Haiti – dengue fever

Desert Storm – leishmaniasis



Disease and Disaster Myths

Post-disaster outbreaks are limited to only those endemic organisms that are currently posing local public health problems

includes all organisms in that region that have caused disease

Dead bodies pose infectious disease risk

disaster victims who were infected with a communicable disease at the time of the disaster are less of a threat to the public than if they were still living

bodies desiccate and body temp drops

The Dead and Disease

Human and animal corpses pose little disease risk to the living

the idea that they are dangerous has led to the incorrect prioritization of resources and significant unnecessary pain for the living

the use of wood to cremate bodies in India (2001 earthquake) and Central American countries (1998 Hur. Mitch) left survivors with no fuel for cooking or heating

Dead bodies can pose a risk of disease if they contaminate the drinking water supply

Those who handle the bodies w/o observing proper hygiene protocols that spread disease

Key Points

The most common infections associated with disasters are: diarrheal, respiratory, and dermatologic

How well a community can withstand the adverse health affects caused by a disaster is dependent upon the strength of the public health system in place prior to the disaster

Population movement, poor sanitation, water contamination, and the interruption of PH programs – the main reasons for the spread of disease after natural or humanitarian disasters

Key Points

Consider some “unlikely suspects” when treating individuals following a disaster or from an area of conflict

Diseases associated with a disaster or conflict can only occur if the infectious agent was in the region prior to the incident or introduced to the disaster-stricken area

Post-disaster outbreaks of transmissible diseases in a region can be due to agents that have been present in the past but have been under control for long periods

Dead bodies pose little or no threat to survivors

References

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