

Examining Communicable Disease in the Context of Natural Disaster

Learning from the Haitian Earthquake to Establish Surveillance Among Displaced Populations

by Annie Rempel

Introduction

The effects of natural disaster – flood, hurricane, tsunami, earthquake, volcanic eruption – can be detrimental to the health of surrounding populations. The immediacy of most extreme weather or tectonic events often produces acute, traumatic injury and an ensuing sense of chaos among inhabitants in the region affected. While immediate health threats, injury, and death are often of major concern in natural disaster contexts, the purpose of this brief is to examine the relationship between natural disasters, displaced populations, and communicable disease. Additionally, this brief is intended to provide policy suggestions to enable the improved tracking and surveillance of displaced populations, vulnerable to disease outbreak, looking to the 2010 Haiti earthquake as a case study.

There is often a misunderstanding regarding the cause of epidemics in post natural disaster contexts⁸. The level of disorganized chaos coupled with the presence of dead and often decaying bodies could give rise to disease outbreak. However, the risk of outbreaks after hurricanes and earthquakes, for example, is much lower than presumed. Unfortunately, there is one major caveat to this otherwise promising claim: the transmission of disease increases remarkably with the displacement of people. After natural disasters, internally displaced populations are placed in temporary shelters or relief camps, which are often overcrowded and lack some of the most basic sanitation. For example, the 2005 South Asian earthquake and tsunami left up to 5 million people from 13 countries (largely Indonesia, Sri Lanka, India, and Thailand) displaced, without adequate access to food and water. Aside from the 226,000 killed in the wake of the disaster, it was estimated that 150,000 additional deaths occurred due to the transmission of infectious disease among the displaced⁴.

Background

Emerging diseases common to populations of people displaced by natural disaster include: diseases associated with crowding, vector borne diseases, and water-related communicable diseases.

In 1991, there was a measles outbreak in the Philippines among individuals displaced by the eruption of Mt. Pinatubo, involving nearly 20,000 cases. Similarly, there were over 400 clinical cases of measles among Pakistanis displaced by the 2005 South Asia earthquake. The transmission of meningitis and acute respiratory infections is also facilitated by the tight living conditions of displaced individuals⁸.

Natural disasters that involve an influx in freshwater through flooding and heavy rainfall often facilitate the occurrence of vector borne disease. The overflow of riverbanks and the pooling of water due to heavy precipitation create new breeding sites for vector populations. For example, flooding associated with El Nino events in Peru have been directly linked to increases in mosquito populations and subsequent outbreaks of malaria⁸. Similar trends have been observed with dengue fever transmission after natural disasters. Interestingly, dengue outbreaks are considered to arise from the increase in artificial containers at temporary settlements. Containers meant to hold water resources or aid in solid waste disposal often end up collecting water and acting as breeding grounds for mosquitoes⁸.

Because water resources and sanitation are often compromised in the aftermath of a natural disaster, diarrheal disease outbreaks often emerge in temporary, relocation settlements. One of the leading causes of diarrheal disease in temporary settlements is the presence of *Vibrio cholera* in water sources due to poor sanitation. Cholera and dysentery warrant particular concern because of their ease of transmission, rapid spread in crowded

conditions, and immediate life threatening conditions⁷.

Why Natural Disaster Response Should be a Priority for Policy Makers

The head of the United Nations Environment Program's Early Warning Unit, Pascal Peduzzi asserts that several factors make it likely that the frequency of natural disasters will go up. If tectonic events are steady and climatic events on the increase, there is cause for serious concern about the impacts of climate change on the frequency of associated hazards³. Understanding and tracking the spread of disease among those displaced by natural disaster is paramount if the number and severity of natural disasters is to increase.

Additionally, from 2008-2013, an average of 27 million people each year were displaced by natural disasters - over three times as many as were displaced by conflict and violence. Trends show that, in absolute terms, the risk of displacement due to weather-related and geophysical hazards has more than doubled in the past four decades⁹.

CASE STUDY: Cholera after the Haiti Earthquake

To better understand the importance of addressing relief efforts targeted at infectious disease among internally displaced individuals, it helps to look at a specific case study: the outbreak of cholera following the 2010 earthquake in Haiti.

On January 12, 2010, a 7.0M earthquake struck Haiti. The initial death toll was over 250,000 with 300,000 acutely injured. The number of individuals displaced from their homes exceeded 1.3 million. Months after the event, an outbreak of cholera unexpectedly emerged in a densely populated zone with little sanitary infrastructure and limited access to potable water⁶. By November 9th, there were 724 confirmed deaths due to cholera and over

11,000 hospitalized. While the outbreak's origin was thought to be outside the displaced-person camps established in response to the earthquake, 521 of 1356 displaced-person camps listed by the UN camp-management cluster reportedly have no water or sanitation agency, and most are far from reaching the established guidelines for sanitation in humanitarian emergencies⁶. The outbreak of cholera in Haiti following the 2010 earthquake can largely be tied to poor sanitation and a lack of potable water. Its widespread impact can be attributed to the conditions found in their displaced-person camps.

Policy Suggestions

In an attempt to improve policies surrounding healthcare preparedness, response mechanisms, and the potential for disease in the face of natural disasters, it is important to 1) better understand the movement and clustering of displaced individuals and 2) generate a public health assessment plan.

A study conducted in direct response to the Haiti earthquake proposes and confirms the efficacy of a compelling tool that can be used to track population movement after a natural disaster: mobile phone data. Researchers recognize that fleeing an affected area is often the first move for large populations hit by a natural disaster. But such large population movements after a disaster can increase the loss of human life by complicating the provision of relief assistance, the assessment of needs, and infectious disease surveillance². Prior to this study, no accurate methods existed to track large-scale population movements caused by natural disaster.

Using mobile phone subscriber identity modules (SIMs), which include position data, researchers were able to retroactively trace the movement of relocated individuals in the aftermath of the Haiti earthquake and subsequent cholera outbreak. Their overall findings suggest that mobile phone data can be used to estimate population movement accurately and rapidly during natural disasters and infectious disease outbreaks².

Some limitations to the use of cellular phone data include: 1) a lack of overall cell phone coverage in vulnerable areas (though as of 2009, 3.2 billion mobile phone subscribers lived in the developing world) and 2) the potential destruction of cell phone towers in the event of a disaster. Regardless, the success of cell phone data to track population movement after the Haiti earthquake suggests using SIM data can aid in improved response to disasters and outbreaks. If this form of geospatial mapping of population movements fails due to the specific natural disaster or proves inadequate given a particular location, it is also important to push for public health initiatives that establish health assessments in locations prior, during, and after natural disasters strike.

To systematically provide relief efforts to an area, the following must be identified:

- 1) Endemic and epidemic diseases that are common in the affected area
- 2) Living conditions of the affected population, including number, size, location and density of settlements
- 3) Availability of safe water and adequate sanitation facilities
- 4) Underlying nutritional status and immunization coverage among the population
- 5) Degree of access to healthcare and to effective case management

Understanding each of these five areas will allow for a more holistic understanding of a region's particular public health risks in the face of any natural disaster threat⁸.

Based on the aforementioned phone usage study in Haiti and more general public health risk assessment guidelines, the following should be prioritized when addressing disease outbreak among displaced people in natural disaster contexts:

- 1) Relief organizations should prioritize forming partnerships with primary mobile phone networks in areas prone to natural disaster.

- 2) Close attention should be paid to the migration of displaced people and the resources available in relocation camps.
- 3) Numbers 1-5 (above) should be fully assessed in areas prone to natural disaster, with findings made available to relief organizations.
- 4) Local and international funding sources must be identified in order to collect reliable population data in disaster prone regions and to monitor post-natural disaster relief efforts.

Additional Sources of Interest

- *Centers for Disease Control and Prevention – Emergency Preparedness and Response: Prevent Illness After a Disaster*

<http://emergency.cdc.gov/disasters/disease/facts.asp>

- *Enhancement of community preparedness for natural disasters*

<http://isw.sagepub.com/content/50/3/357.full.pdf+html>

- *Most disaster prone countries*

<http://uk.reuters.com/news/picture/most-disaster-prone-countries?articleId=USRTR2EFDJ>

- *The Challenge in Disaster Reduction for the Water and Sanitation Sector: improving quality of life by reducing vulnerabilities*

http://www.unicef.org/lac/DesafioDelAgua_Eng%282%29.pdf

- *Global Estimates 2014: People displaced by disasters*

<http://reliefweb.int/sites/reliefweb.int/files/resources/201409-global-estimates.pdf>

Citations

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