

**DISEASE ASSOCIATED WITH NATURAL DISASTERS, THE CASE OF DENGUE FEVER.** J. Aldstadt<sup>1</sup>,  
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**Introduction:** Dengue fever and dengue hemorrhagic fever (DHF) have emerged as the most important arboviral diseases worldwide. They are caused by four different but distinct dengue viruses, and the most important vectors are mosquitoes of the *Aedes* genus. Dengue viruses circulate in all tropical regions of the world, where more than 2.5 billion people are at risk of infection. Many dengue endemic regions are also at risk for natural disasters. This talk examines the likely impacts that natural disasters have on dengue fever transmission in light of the latest research on dengue virus transmission and some data collected after natural disasters.

**Dengue Fever:** Dengue fever and dengue hemorrhagic fever (DHF) are emerging public health problems in the tropical regions of the world. Dengue has spread from being endemic in just 9 countries in 1970 to 100 countries in 2002 [1]. The World Health Organization (WHO) estimates that there are approximately 50 million dengue infections annually. Additionally, there are approximately 500,000 cases of DHF, with at least 2.5% of these being fatal. DHF is a leading cause of hospitalization and mortality among children in many Asian countries [2]. Dengue virus infections may be asymptomatic or may cause mild febrile illness, dengue fever, or DHF. The proportion of infections causing illness varies widely based on the immune status, virus strain, and age structure of the host population. A vaccine for dengue is not yet available. The primary method of prevention is to control the leading mosquito vector, *Aedes aegypti*.

**The Vector:** *Aedes aegypti* is a cosmopolitan mosquito. Dispersed by human movement from its ancestral origin in Africa, this species is now abundant in cities and villages of all tropical regions. *Aedes aegypti* is highly adapted to the environments created by man. The species was eradicated from much of the Americas and the Mediterranean basin during efforts to control Yellow Fever during the 1950s and 1960s [3]. The re-emergence of this powerful vector is primarily a result of the ecological changes brought about by human activities [4]. Chief among these forces are increases in world trade, urban expansion, and deterioration of urban environments. There are two limiting factors on *Aedes aegypti* populations in a settlement: the availability of breeding sites and climate. This vector is unable to overwinter in a dormant state and does not survive in temperatures below 0°C. This species is not an effective vector of the dengue virus when average ambient temperature is below 30 °C [5].

**Dengue and Natural Disasters:** When natural disasters occur in dengue endemic regions it is certainly the case that dengue outbreaks should be a part of the planning. It is not clear, however, the events that re-

sult in excess water result in more breeding sites. *Aedes aegypti* prefer clean water in artificial containers. Extreme rainfall events and flooding may provide more breeding sites, but there it is also likely that existing immature mosquitoes will be flushed from containers. It should also be noted that *Aedes aegypti* do not breed in salt water, and would be poisoned in the case of flooding with seawater. Depending on water temperature, it takes between 10 days and three weeks for adult mosquitoes to emerge from the aquatic stages [4]. A large immature population loss due to overflowing containers could interrupt the dengue transmission cycle and lower adult populations for several months. If a disaster impacted local water delivery infrastructure, there would be a need to store more water in artificial containers. This would create more breeding sites and increase vector populations.

*Aedes aegypti* is not a strong flyer and is not believed to be responsible for long distance transmission of dengue virus [6]. Transmission between settlements is the result of the movement of people that have been infected with dengue virus. If natural disasters result in greater than normal migrations or a large influx in relief workers, great care should be taken so that the virus is not spread into or out of disaster areas. Current and accurate information on dengue activity is vital in this regard.

**Conclusion:** Dengue fever outbreaks or epidemics related to a disaster situation would occur only weeks or months after the disaster. Extreme events such as hurricanes, floods, and tsunamis that result in inundation would result in lower *Aedes aegypti* populations and reduce or disrupt dengue transmission in the short term. Disasters that disrupt domestic water supply and result in increased water storage are likely to increase vector abundance. These disasters may result in increased dengue activity, but the effects would not be felt immediately. With any large movement of people and supplies there is a risk of transporting virus and vectors into previously unexposed regions. Care should be taken to prevent the further spread of dengue virus or *Aedes aegypti* in any relief effort.

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