



# EARLY WARNING SYSTEMS

Robert E. Antosia, MD, MPH\*

Early warning systems rely on both intelligence information and surveillance data for mitigation and response to a disaster. They have been developed to help predict many types of disasters: natural, manmade, war/conflict, and humanitarian crises. Such systems may include: seismic monitors, weather forecasts, satellite images, food stores and agriculture, economic activity, political situations, infant/child mortality rates, and disease-surveillance systems. Additionally, there must be a routine flow of information so that people are both disaster-aware and mitigation-aware. Evacuation can be considered a step in mitigation, by removing people from an area of potential harm. There are several threats that can result in evacuation, including natural disasters (flood, tsunami, volcano, etc.) and some manmade disasters. This chapter will focus on early warning systems for natural disasters and bioterror (BT) events.

While some natural disasters such as hurricanes may be predicted with some advanced warning, we remain unable to predict earthquakes with any degree of reliability. However, after the occurrence of large-scale undersea earthquakes, which can be recorded on seismic monitoring networks worldwide, preliminary warnings can be raised for coastal regions at risk for tsunamis. These warnings are circulated via established communication systems. In the US, for example, a national warning system is in place that is used to contact emergency personnel, as well as the use of radio, television, and the internet. The US National Tsunami Hazard Mitigation Program highlights the key principles of Tsunami hazard planning, including hazard assessment, mitigation, and warning guidance. Early warning systems for tsunamis exist for the Pacific Rim, Japan, the west coast of the US (including Alaska and Hawaii), and South America. The effectiveness of these systems is proven, and could have prevented tens of thousands of deaths on December 26, 2004 if an early warning system was present in the Indian Ocean. The tsunami that struck 11 countries in South Asia that day resulted in a disaster of apocalyptic proportions. Had alerts from existing networks reached the stricken countries, the impact could have been mitigated further with improved communication systems and education regarding awareness of the true danger.

\*Department of Emergency Medicine, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston

Unfortunately, most terrorist attacks occur with little or no warning. In response to the terrorist attacks in the US on September 11, 2001, the United States created the Department of Homeland Security. This entity has nine components: border and transportation security, emergency preparedness and response, information analysis and infrastructure protection, science and technology, management, coast guard, secret service, citizenship and immigration services, and the inspector general. The department overlooking emergency preparedness and response established a five-tiered, color-coded security advisory system based on the perceived threat level of a terrorist attack. The highest risk level is termed "severe" and is coded red; a "high" level of risk is coded orange; an "elevated" or significant risk is coded yellow; a "guarded" or general level of risk is coded blue; and a "low" risk of terrorist attacks is coded green. This serves to notify the media, general public, police and military officers, and public health agencies in an attempt to improve awareness and readiness should an attack occur.

European governments and most other countries have avoided the drastic organizational changes for disaster planning and management that have recently occurred in the US. In many countries, the preparation and response to bioterrorism and other public health problems are led by applied epidemiology and training programs (AETPs), which are part of, or closely affiliated with, the host country's ministry of health. AETPs cover approximately 45 countries, and most are strengthened by support from various partners, including representatives from the Centers for Disease Control (CDC) and the World Health Organization (WHO).

Improved global surveillance efforts should be instituted with as close to real-time data gathering as possible. All facets of surveillance should be used and should include emergency department visits, laboratory data, pharmacy use, school absenteeism, and any other data that may correlate with an outbreak of infectious disease. Robust surveillance systems are essential in detecting any emerging or reemerging diseases that may represent a possible BT attack. Quick recognition of any change in disease patterns will facilitate determination of the source and help limit further exposure. With applied epidemiology and training programs, close attention to disease patterns, and a basic knowledge and understanding of the threat of BT, actions can be taken to decrease the impact of disease and disasters, regardless of their etiology.

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## RESOURCES

[http://www.hewsworld.org/home\\_page/default.asp](http://www.hewsworld.org/home_page/default.asp)  
<http://www.reliefweb.int/resources/ewarn.html>

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