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# Disaster Assessment: The Emergency Health Evaluation of a Population Affected by a Disaster

From the Disaster Assessment & Epidemiology Section, Health Studies Branch, Division of Environmental Hazards and Health Effects, National Center for Environmental Health, Centers for Disease Control and Prevention, Atlanta, Georgia;\* and Division of Emergency Medicine, Department of Surgery, University of Hawaii, Honolulu.†

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**Scott R Lillibridge, MD, FAAFP\***  
**Eric K Noji, MD, MPH, FACEP\***  
**Frederick M Burkle, Jr, MD, MPH,**  
**FAAP, FACEP†**

In the past decade, interest in the operational and epidemiologic aspects of disaster medicine has grown dramatically. State, local, and federal organizations have created vast emergency response networks capable of responding to disasters, while hospitals have developed extensive disaster plans to address mass casualty situations. Increasingly, the US armed forces have used both their ability to mobilize quickly and their medical expertise to provide humanitarian assistance rapidly during natural and manmade disasters. However, the critical component of any disaster response is the early conduct of a proper assessment to identify urgent needs and to determine relief priorities for an affected population. Unfortunately, because this component of disaster management has not kept pace with other developments in emergency response and technology, relief efforts often are inappropriate, delayed, or ineffective, thus contributing to increased morbidity and mortality. Therefore, improvements in disaster assessment remain the most pressing need in the field of disaster medicine.

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## INTRODUCTION

A disaster can be defined broadly as a "disruption of the human ecology that exceeds the capacity of the community to function normally."<sup>1</sup> Although in the past relief agencies have focused on natural disasters such as earthquakes and hurricanes, technological disasters also are of critical concern. Disasters such as the 1984 release of methyl isocyanate gas from a chemical factory in Bhopal, India, and the 1986 explosion in a nuclear power plant in Chernobyl, in the former Soviet Union, underscore the growing dangers associated with industrialization.<sup>2-4</sup> In addition to the adverse effects of modern warfare on public health, both world population growth and urbanization have substantially increased the risk of injury and death from disasters.<sup>5-7</sup>

The critical first step in addressing the acute needs of a population affected by a disaster is to obtain information regarding the extent of the acute disruption to public health.<sup>8</sup> Important public health areas likely to be interrupted after a disaster range from the provision of medical services to vector control. Effective disaster response addresses the aggregate of these acute public health concerns in an integrated manner. Disaster assessment provides relief managers with objective information about the effects of the disaster on a population, generated on the basis of rapidly conducted field investigations. These assessments are used to match available resources to a population's emergency needs. The early completion of this task and the subsequent mobilization of resources to address urgent medical and environmental needs can significantly reduce the adverse public health consequences of a disaster.<sup>9</sup> As fundamental as this concept may appear, examples of improper disaster assistance based on incomplete or inadequate needs assessment are not difficult to find.<sup>10,11</sup> Poorly organized disaster relief diverts limited resources from areas where these assets could be used more effectively.<sup>12</sup> Ironically, although many government and volunteer agencies have developed extensive disaster response capabilities, the underuse and lack of coordination of disaster assessment have contributed to a pervasive cycle of inappropriate, and often ineffective, disaster relief.<sup>13-15</sup>

#### DISASTERS: GLOBAL PERSPECTIVES

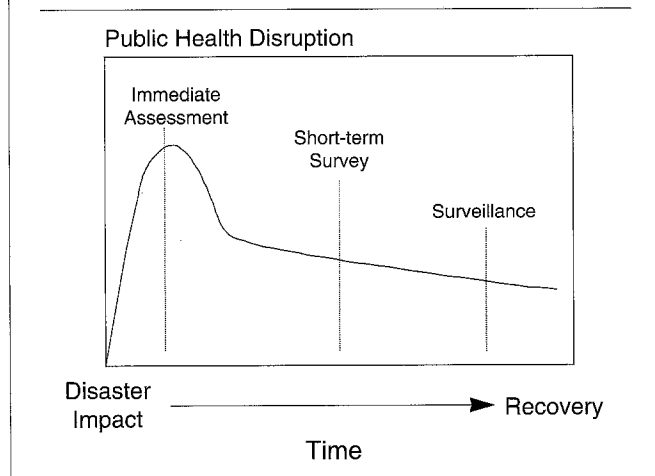
Worldwide, approximately one major disaster of a magnitude likely to generate relief activity from international, national, or nongovernment agencies occurs each week. To respond appropriately to requests for assistance from both domestic and foreign governments, the US government must acquire timely and accurate information about the effects of the disaster on the health of the stricken population.<sup>16</sup> Unfortunately, little consensus exists within the disaster medicine community about the quality of data or the appropriate time to collect this information at the disaster site.<sup>17</sup> As a consequence, insurance adjusters and journalists often arrive in the vicinity well before disaster assessment personnel. The problem of obtaining adequate disaster assessment is compounded further by the fact that few emergency response managers or relief agencies have extensive field experience in this area. Although we cannot say precisely when a disaster will occur, our inability to characterize rapidly the emergency health needs of an affected population undoubtedly will lead to increased human suffering at a greater economic cost.<sup>18</sup>

#### DISASTER ASSESSMENT PROCESS

Relief agencies and emergency response officials use the information obtained from disaster assessments to make operational decisions about allocating resources.<sup>13,19</sup> In the emergency response phase, essential emergency medical measures take the highest priority and are implemented without benefit of a complete assessment. Optimally, in this phase, assessment and response should occur simultaneously. Local and regional emergency and public health resources are reassigned or adjusted as the results of the initial disaster assessment are reported. The initial assessment of a disaster site should identify details about the character and extent of the needed emergency response, list the technical assistance that may be requested, prioritize those secondary health care needs requiring focused surveys (eg, the nutritional status of the population), and identify sentinel public health events that will require postdisaster surveillance in the recovery and rehabilitation phases<sup>20,21</sup> (Figure 1).

Disaster assessment is organized within an epidemiologic framework that collects and processes information that best characterizes the urgent needs of the affected population.<sup>22</sup> Because populations affected by disasters require more than emergency medical services, information on a range of urgent public health issues is required to orchestrate an effective relief effort.<sup>23</sup> For example, past experiences have shown that providing temporary shelter quickly or ensuring access to potable water for persons displaced by the disaster may be of primary importance in reducing morbidity and mortality among disaster victims.<sup>24,25</sup> Figure 2 lists important public health areas that

**Figure 1.**  
Disaster-related public health disruption plotted against time



must be considered for inclusion in any disaster assessment strategy designed to characterize rapidly the emergency needs of an affected population.<sup>26-28</sup>

The disaster assessment team must prioritize the focus of their emergency evaluation in a manner that benefits the largest group of imperiled individuals affected by the most correctable problems. This approach is consistent with the most basic principles of effective triage.<sup>29</sup>

During disasters, an imprecise knowledge of the characteristics of the affected population, ongoing hazards, logistical problems, and severe time constraints often requires that the assessment team use a rapid and valid field sampling method to evaluate effects of the disaster on a population's health.<sup>30,31</sup> As in all cases involving techniques of statistical sampling, the team must choose a representative cross section of the population within the geographic confines of the disaster (eg, rural and urban, young and old, near and remote).<sup>32-35</sup> Although it may be exceedingly difficult for the assessment team to maintain a clear focus on the emergency health evaluation while working amid survivors who may be overburdened with disaster victims, providing direct patient care is not the primary objective of the team. A diversion from the essential assessment task to direct patient care only delays the overall allocation of emergency resources by response officials to the specific areas or populations with the most pressing needs.

There are many reasons why persons conducting disaster assessments should strive to obtain information from all of the affected regions and populations within the disaster site. **Most important, all regions may not be affected uniformly by a disaster. Consequently, some regions may contain populations so severely affected by a particular disaster that entire cities are rendered completely inaccessible and incapable of communicating because of the**

destruction of local roads and communication systems. On the other hand, regions with relatively minor damage and intact communications systems may be able to convey graphic images of highly localized destruction to disaster relief agencies, thereby diverting attention from more devastated regions. For example, during the 1976 Guatemalan earthquake, the mortality rates between cities varied from 36.1 to 234.1 deaths per 1,000 inhabitants.<sup>36</sup> Several of the most devastated villages were isolated by landslides and were unable to communicate their urgent needs to the outside world. It would have been incorrect to interpret that the lack of requests for outside assistance from these remote villages meant emergency relief was not urgently needed.

Even among populations with similar physical exposures to disaster conditions, the destructive impact among different groups of individuals may not be equal. Our experience with populations displaced by armed conflict or natural disasters in less developed countries has shown disproportionately high levels of morbidity and relatively high crude mortality rates among the very young because of a combination of the effects of poor nutrition and communicable diseases.<sup>25</sup> Thus, an emergency assessment that targeted only the male head of a household would not have identified the emergency needs of this vulnerable subpopulation.

The relatively low priority accorded to infectious disease surveillance during the initial disaster assessment is due to the consistent finding that the incidence of communicable diseases has been extremely low during the initial stage of sudden-impact disasters (eg, earthquake, tornado, or chemical release).<sup>14,37,38</sup> When infectious diseases occur after a disaster, these illnesses are more likely to be endemic in nature and common rather than exotic and usually are due to overcrowding or to a lapse in common public health practices. Such breaches include failing to maintain satisfactory water quality or curtailing basic preventative services, such as routine immunization of the population against measles.<sup>25,39</sup>

The specific information collected and the sampling strategy used during a disaster depend on the nature of

**Figure 2.**  
*Information to collect during an emergency health assessment of a disaster site*

- Geographic extent of disaster's impact
- Population at risk or affected
- Presence of continuing hazards
- Injuries and deaths
- Availability of shelter
- Access to potable water
- Nutritional status of affected population
- Current level of sanitation
- Status of health care infrastructure
- Level of communications network
- Status of transportation system
- Incidence of communicable disease

**Figure 3.**  
*Disaster assessment priorities related to type of disaster*

Sudden-Impact Disasters	Gradual-Onset Disasters
Ongoing hazards	Mortality rates
Injuries and deaths	Nutritional status
Shelter requirements	Immunization status
Potable water	Environmental health

the disaster. During a sudden-impact disaster, the initial assessment should be completed within 24 to 48 hours.<sup>23</sup> Slow-onset disasters such as droughts, famines, or situations that create displaced populations may not be recognized as disasters for several months.<sup>40</sup> In such circumstances, teams should make a baseline assessment and institute long-term surveillance. This surveillance, designed to direct and monitor the effectiveness of both ongoing relief activities and changes in the affected population's health status, may be the most important task for the assessment team.<sup>41</sup> Figure 3 lists examples of assessment priorities whose relative importance to the overall assessment process depends on the type of disaster and other environmental factors, such as climate and geography.

#### DEVELOPMENT OF DISASTER ASSESSMENT METHODS

The world community is now linked by nearly instantaneous communications networks. Advances in transportation permit relief workers to respond to international emergencies within hours rather than days, and disasters are now depicted in the media as live dramas, a phenomenon that raises both humanitarian and political concerns. As a consequence, emergency response managers must make decisions about implementing relief activities in less time, a fact that intensifies the need for timely and accurate information. Expectations that the process of disaster assessment might develop primarily as a high technology specialty involving satellite reconnaissance and computerized casualty models have not fully materialized. The critical development, which has stood the test of time, is the realization that early on-site collection of a limited amount of key information about representative populations usually will provide adequate public health intelligence on which to base emergency relief decisions.<sup>19,42,43</sup> In these circumstances, data collection remains a labor-intensive field process that draws on the talents of a variety of health-related disciplines.

During the 1970s and 1980s, interest in the epidemiology of disasters accelerated. New professional societies and scientific forums for the presentation of original work in this field appeared under the mantle of what is now called disaster medicine.<sup>44</sup> In the early 1980s, to improve our nation's disaster response capabilities, the National Disaster Medical System was developed as a joint endeavor by four federal agencies—the Department of Health and Human Services, Department of Defense, Department of Veterans Affairs, and Federal Emergency Management Agency—and the civilian medical community.<sup>45,46</sup>

However, not all relief organizations place a high priority on the early and rapid evaluation of the health status of the affected population as a management tool of emergency response. As a consequence, the lack of objective information concerning the effect on the population at the disaster site consistently leads to poorly applied relief efforts and may result in public perceptions of mismanagement, even when the response generally has been effective.<sup>14,47</sup>

This deficiency in disaster response is exacerbated by several other factors including lack of time in which to organize a disaster assessment strategy, reluctance of relief workers to keep records, and movement of populations from and into disaster-affected areas.<sup>48</sup> In addition, many countries or regions devastated by a disaster may lack public health personnel with the epidemiologic expertise or the supporting data-handling and communications resources necessary to conduct a disaster assessment. Up to this point, there have been few institutions or government agencies to which disaster managers could turn for experience and expertise about conducting an emergency health assessment of a disaster site.

In the 1990s, to address these longstanding deficiencies in disaster management, the World Health Organization (WHO), assisted by three of its Collaborating Centers for Emergency Preparedness and Response, began to standardize and systematically analyze the process of rapid disaster assessment. In January 1990, WHO completed work on a number of rapid epidemiologic assessment protocols designed to guide disaster assessment teams in evaluating disasters ranging from sudden-impact

**Figure 4.**

*Recent CDC emergency health assessments of natural and technological disasters, 1991 through 1992*

- Chemical fire, Thailand
- Cyclone, Bangladesh
- Civil war, Macedonia-Croatia
- Civil war, Somalia
- Earthquake, Egypt
- Earthquake, Tajikistan
- Environmental impact, Persian Gulf War
- Drought, southern Africa
- Flooding, Peoples Republic of China
- Flooding, central Texas
- Flooding, Puerto Rico
- Haitian migrants, Cuba
- Hurricane, Florida-Louisiana
- Kurdish refugees, Iraq
- Public health evaluation, former Soviet Union
- Tornadoes, Kansas
- Typhoon, Marshall Islands
- Volcanic eruption, Philippines
- Volcanic eruption, Chile/Argentina
- Volcanic eruption, Nicaragua

natural disasters to outbreaks of infectious meningitis.<sup>49-51</sup> These protocols are standardized instruments that direct assessment activities toward sentinel events or conditions in order to rapidly measure the effect of a disaster on a population's health. These relatively simple protocols can be modified or incorporated into disaster preparedness and response activities at the local level. This flexibility is extremely important because despite the recent development of a massive international humanitarian relief network, the local community continues to bear the principal responsibility for disaster preparedness, mitigation, and response. Furthermore, relief workers who use assessment protocols containing a degree of standardization will contribute to a common data base that will allow disaster researchers to better compare the health effects of one disaster with another.<sup>38,52</sup> A predictable assessment process also enables field personnel to communicate verifiable information to managers of relief operations.

Refining the disaster assessment process is a major priority at the Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia. Public health professionals from a variety of disciplines are working at this agency to refine and standardize assessment protocols and field-surveillance techniques. One important activity at the CDC has been to improve microcomputer-assisted methods for collecting, analyzing, and reporting health-related information to and from disaster sites. As one of the WHO Collaborating Centers for Emergency Preparedness and Response, the CDC routinely dispatches emergency assessment teams to disaster sites both in this country and throughout the world (Figure 4).

Recently, CDC and state health officers, working simultaneously in Florida and Louisiana in response to Hurricane Andrew, used standardized disaster assessment methods to rapidly identify emergency public health needs of the affected populations. Specifically, their purpose was to rapidly acquire information for relief officials on the need for medical care, water, food, and other basic services among survivors of the disaster. In both states, the populations in the most devastated areas were surveyed using a field technique originally developed to assess smallpox vaccination coverage in less developed countries.<sup>53</sup> To obtain information from a representative sample of residents, assessment teams randomly chose and surveyed 30 clusters of seven households. Using a standardized questionnaire, the team interviewed an adult member of each household. Within hours, data collected by assessment teams were summarized in a report to emergency relief decision makers. In the first days after Hurricane Andrew, these assessments were one of the few objective

measures of the disaster's impact on the population that disaster managers could use to prioritize their options for effective action.<sup>19</sup>

## SUMMARY

Disasters occur with increasing frequency because of explosive population growth, poor land use management, and industrialization.<sup>44,54,55</sup> Modern warfare, which has damaged the environment and wreaked havoc on civilian populations, continues to have a negative effect on public health.<sup>56,57</sup> Advances in telecommunications and transportation have enhanced our awareness of catastrophic events and have increased the worldwide demand for humanitarian action or emergency relief. During the past 25 years, many governments and international relief agencies have made substantial investments in disaster preparedness and response activities. Unfortunately, past disaster relief actions often have been ineffective, partly because of inadequate needs assessment and the absence of ongoing public health surveillance.

Standardized disaster assessment protocols and methods have great potential to identify rapidly the acute public health needs of populations affected by a disaster and to direct resources to areas and populations most in need during both the response and recovery phases of the disaster. As the emergency response community moves from *ad hoc* disaster relief actions to more effective disaster prevention and mitigation activities, cooperation generated among relief organizations, governments, and academic institutions on the basis of commonly accepted assessment methods will prove critical.<sup>58,59</sup> Proper disaster assessment can increase our basic knowledge about the adverse public health consequences of natural and technological disasters and assist planners in developing improved disaster prevention and mitigation strategies.<sup>60</sup> Improving and refining the disaster assessment process should be a priority during the 1990s—an era designated by the United Nations General Assembly as the International Decade for Natural Disaster Reduction.<sup>61</sup>

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## Address for reprints:

Scott R Lillibridge, MD, FAAP  
Centers for Disease Control and Prevention  
Mailstop F-46  
4770 Buford Highway NE  
Atlanta, Georgia 30341-3724