

# The Public Health Dimension of Disasters— Health Outcome Assessment of Disasters

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## Abbreviations:

15WCDEM = 15th World Congress on Disaster and Emergency Medicine  
CGOR = Centre of Health Impact Assessment of Disasters  
PTSD = post-traumatic stress disorder  
TAP = targeted agenda program

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## Abstract

A broad range of health problems are related to disasters. Insight into these health problems is needed for targeted disaster management. Disaster health outcome assessment can provide insight into the health effects of disasters.

During the 15th World Congress on Disaster and Emergency Medicine in Amsterdam (2007), experts in the field of disaster epidemiology discussed important aspects of disaster health outcome assessment, such as: (1) what is meant by disaster health outcome assessment?; (2) why should one conduct a disaster health outcome assessment, and what are the objectives?; and (3) who benefits from the information obtained by a disaster health outcome assessment?

A disaster health outcome assessment can be defined as a systematic assessment of the current and potential health problems in a population affected by a disaster. Different methods can be used to examine these health problems such as: (1) rapid assessment of health needs; (2) (longitudinal) epidemiological studies using questionnaires; (3) continuous surveillance of health problems using existing registration systems; (4) assessment of the use and distribution of health services; and (5) research into the etiology of the health effects of disasters.

The public health impact of a disaster may not be immediately evident. Disaster health outcome assessment provides insight into the health related consequences of disasters. The information that is obtained by performing a disaster health outcome assessment can be used to initiate and adapt the provision of health care. Besides information for policy-makers, disaster health outcome assessments can contribute to the knowledge and evidence base of disaster health outcomes (scientific objective). Finally, disaster health outcome assessment might serve as a signal of recognition of the problems of the survivors.

Several stakeholders may benefit from the information obtained from a disaster health outcome assessment. Disaster decision-makers and the public health community benefit from performing a disaster health outcome assessment, since it provides information that is useful for the different aspects of disaster management. Also, by providing information about the nature, prevalence, and course of health problems, (mental) health care workers can anticipate the health needs and requirements in the affected population.

It is important to realize that the disaster is not over when the acute care has been provided. Instead, disasters will cause many other health problems and concerns such as infectious diseases and mental health problems. Disaster health outcome assessments provide insight into the public health impact of disasters.

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## Introduction

A broad range of health problems may result from disasters. In the short term, disasters may cause mortality and morbidity due to injuries and exposure to toxic substances. Also, disasters may lead to outbreaks of infectious diseases when water systems are disrupted, and/or the availability of healthcare

systems is limited.<sup>1</sup> Since disasters engender different types of stressors such as threat to one's life, exposure to fatalities, bereavement, profound loss, and social and community disruption that have lasting effects, the impact of disasters most often is much broader than the acute health problems that occur.

During the past decade, many governments have learned that a disaster is not over when the fire has been extinguished or when acute care has been provided. Besides acute care, long-term policy and healthcare activities are needed. This is part of targeted disaster management and often requires information about healthcare utilization, the range of health problems, and the societal impact of the disaster. Disaster Health Outcome assessments can provide insight into the health effects of the disaster, the nature and magnitude of disaster experiences, high-risk groups in the area affected, and the needs of the disaster-affected population.

During the 15th World Congress on Disaster and Emergency Medicine in Amsterdam, May 2007 (15WCDEM), experts in the field of disaster epidemiology discussed important aspects of disaster health outcome assessment, such as:

1. What do we mean by disaster health outcome assessment?;
2. Why should one conduct a disaster health outcome assessment, and what are the objectives?; and
3. Who benefits from the information obtained by a disaster health outcome assessment?

## Methods

The Centre of Health Impact Assessment of Disasters (CGOR) was invited to organize a Targeted Agenda Program (TAP) at the 15WCDEM. To compose a diverse discussion group, the CGOR invited experts of different background who worked in different countries. In the final discussion group, six nationalities were represented and the group included experts in the field of medicine (HF, SP, RS), epidemiology (LG, TL, MR), psychology (BvdB), medical sociology (CJY), and toxicology (KG, MR).

Prior to the opening of the Congress, a Web-based discussion was initiated in which the objectives of a disaster health outcome assessment were discussed. It was planned that the more technical pitfalls of performing disaster health outcome assessment would be discussed during the Congress. However, on the first day of the Congress, it became clear during the presentations by the authors that different experts defined disaster health outcomes and assessments differently. For that reason, the TAP-group started by drafting a common definition of the term of disaster health outcome assessment. In addition, it appeared that many clinicians, who were the main target audience of the Congress, were not fully aware of the public health impact of disasters. Most clinicians are more involved with affected victims that present to hospital emergency departments. Since the impact of disasters is much broader, it was decided to begin with raising awareness about the public health impact of disaster by answering the questions: Why conduct a disaster health outcome assessment?; and Who will benefit from the information provided by disaster

health outcome assessment?. The question on how to raise awareness was discussed in two workshops on the second and third days of the Congress (15 and 16 May 2007).

## Results

### *What is a Disaster Health Outcome Assessment?*

A disaster health outcome assessment is a systematic assessment of the current and potential health problems in a population affected by a disaster. Different methods can be used to examine the health problems and health needs of the affected population, such as: (1) rapid assessment of health needs; (2) (longitudinal) epidemiological studies using questionnaires; (3) continuous surveillance of health problems using existing registration systems; (4) assessment of the use and distribution of health services; and (5) research into the etiology of the health effects of disasters.

The goal of disaster response is to contribute to the restoration of control at both the individual and societal levels. To reach this goal, disaster management should include activities such as: (1) needs assessments; (2) matching available resources with defined needs; (3) prevention of additional adverse health effects; (4) implementation of disease-control strategies and guidelines; (5) evaluation of the effectiveness of the application of these strategies; and (6) improvements in contingency planning for future disasters.<sup>2</sup> Disaster health outcomes and assessments provide information that is useful for many aspects of disaster management. For example, insight into the health problems of survivors is useful for matching available resources to the healthcare needs of the survivors. Other necessary activities of disaster management include exposure and risk assessment, communication about risks of exposure or about the outbreak of infectious diseases, and taking measures to prevent and control adverse effects.<sup>3</sup>

### *Why Conduct a Disaster Health Outcome Assessment?*

During disasters, many more people are affected than those who present to the hospital emergency department. The public health impact of the disaster may not be immediately evident. Many studies have shown a positive relationship between disasters and psychological problems such as the development of the post-traumatic stress disorder (PTSD), depression, and anxiety.<sup>4,5,6</sup> The peak of the psychological problems among survivors occurs within the first year after the onset of the disaster. These psychological problems may last for years.<sup>5</sup> A disaster also may have delayed disease effects such as birth defects that occurred after the Bhopal disaster.<sup>7</sup> On a societal level, the disaster might cause unrest and mistrust in the government. For example, after an airplane crash in Amsterdam, suspicion about the involvement of toxic substances in the cargo resulted in complex theories and speculations about health problems among the survivors.<sup>8</sup>

Disaster management not only should focus on acute health care—other consequences that can influence the health of the population include financial problems and suspected or real toxicological exposure. Knowledge about the health impact or health-related consequences of disasters is important. Information may be necessary and can be collected in a disaster health outcome assessment.

Different main objectives of disaster health outcome assessments can be recognized.<sup>1,9</sup> At an individual level, health outcome assessments provide insight into the health problems of individual survivors and their possible relationships to the disaster. The goal of the information collected by disaster health outcome assessment is to optimize the treatment of the individual survivor.

At a group level, a disaster health outcome assessment provides management information for decision-makers and healthcare workers. It provides insight into the number, nature, course, and severity of the health problems. Different health problems occur at different times after the precipitating event and surveillance for the health effects is essential for providing an effective public health response over a prolonged period of time. For example, after a fireworks disaster in the Netherlands in 2000, blood and urine samples were taken and a longitudinal study between 2000 and 2003 into the health effects of the disaster, was performed. The analyses of the blood and urine samples served to exclude relevant exposure to chemicals due to the event.<sup>10</sup>

A disaster health outcome assessment also is very useful to identify groups of survivors that are at increased risk for chronic health problems. For example, the longitudinal study after the fireworks event indicated that the prevalence of persistent psychological problems such as post-traumatic stress disorder, depression, and anxiety was 2–3 times higher among immigrant survivors and survivors who had lost their house.<sup>11</sup> In Toulouse, after the AZF factory explosion, subjects who had financial difficulties or severe damages to their homes had higher levels of PTSD.<sup>12,13</sup>

The effects of management interventions can be evaluated by means of a disaster health outcome assessment. For example, during the Missouri heat wave (summer 1980), an investigation was performed to study risk factors for heatstroke. In this study, the use of air conditioning, even for a short period each day, was found to be protective, while an inverse association between the use of electric fans and heatstroke could not be demonstrated. This finding suggested that the use of electric fans should not be allocated in this manner during future heat waves.<sup>14</sup> Linking health outcome assessment studies to risk factors and the actual emergency responses can provide insights to improved preparedness and responses for future disasters. A disaster health outcome assessment also can provide information about the effectiveness of psychological interventions, such as debriefing, emotional support, and cognitive behavioral therapy. Finally, since monitoring the health of the population affected by the disaster might have a reassuring effect or might prevent speculations about possible exposure to toxic substances, a disaster health outcome assessment can be viewed as an intervention in itself.

The information that is obtained by performing a disaster health outcome assessment can be used to initiate and adapt the provision of health care. For example, after the AZF explosion in Toulouse, France in 2001, an epidemiological study indicated that many survivors had hearing problems due to the explosion; this information was used to recommend a screening of hearing loss in the population around the site of the explosion.<sup>15</sup> Also, information col-

lected from registration systems was used to recommend an increase in the provision of mental health services to those affected to the AZF explosion.<sup>12</sup>

Besides providing information for policy-makers, a disaster health outcome assessment can contribute to the knowledge and evidence base of disaster health outcomes (scientific objective). Disasters can be viewed as natural experiments in which survivors are affected at random. A disaster health outcome assessment can contribute to new knowledge about the etiology of disaster-related health problems and to the understanding of mechanisms that relate disaster to health problems among survivors. For example, after the fireworks explosion in the Netherlands, a study reported that survivors have an increased levels of physical symptoms such as headache, fatigue, and pain in joints and muscles up to four year post-event.<sup>16</sup> This study has increased the awareness that physical symptoms, besides mental health problems, are part of the distress reaction following traumatic exposure.

Also, recent studies have shown that disaster-related stress is a risk factor for the development of hypertension and other vascular problems.<sup>17,18</sup> Future studies might provide more insight into the relationships between psychological distress and physical health problems. In this way, a disaster health outcome assessment can improve the understanding of the possibilities to prevent health problems during disasters.

Finally, a disaster health outcome assessment also might serve as a signal of recognition of the problems encountered by survivors. For the survivors, it is important that they feel that their health problems and possible exposure to toxic substances are taken seriously. Besides authorities may build or strengthen a pro-active, caring, and transparent reputation by performing a disaster health outcome assessment about the distributions of risks. Indeed, not performing a disaster health outcome assessment may result in speculation, unrest, and mistrust in the government, especially when exposure to toxic substances is possible or the government is (partly) responsible for the disaster itself. In the years after the Bijlmer airplane crash in 1992, survivors started to attribute health problems such as fatigue, concentration, and headache to suspected exposure to toxic substances that were released from the cargo on board the aircraft.<sup>19,20</sup> Eight years after the crash, public and political unrest still resulted in new studies into the health effects related to the crash and a parliamentary inquiry.<sup>8,19,20</sup>

In France, the debate about the potential health effects of the Chernobyl event still is ongoing 20 years after the event.<sup>21</sup> In 2002, an epidemiological surveillance system was established in response to worries concerning a possible increase in the incidence of thyroid cancers.<sup>22</sup>

These examples indicate that although performing a disaster health outcome assessment is complicated and expensive, performing a disaster health outcome assessment immediately or at a relatively short-term post-event, might prevent a second disaster of suspicion and societal unrest.

Despite the importance of a disaster health outcome assessment, it is not advocated that a disaster health outcome assessment be conducted after each disaster. A disas-

ter health outcome assessment only should be performed if appropriate help and support can be offered. For example, if an exposure is known, individuals can be screened for exposure or disease. However, those potentially exposed should only be screened if evidence-based treatment or interventions are available. In addition, several alternatives are available for a disaster health outcome assessment based on a large-scale, epidemiological study. For example, a telephone line might be a useful and less expensive way to support the public health response and to help to identify concerns and respond to worries. Offering such services also can be a legitimate mechanism to contact or follow-up the impact on the affected population. For example, after the London bombing, Hepatitis B screening was offered for those who were exposed to blood from other victims. In addition, it might be useful to register those who were exposed to the plume of a fire in order to contact them only when the composition of the smoke is known and possible health risks are known.

#### *Who Benefits From the Information Obtained from a Disaster Health Outcome Assessment?*

Several stakeholders may benefit from the information obtained by disaster health outcome assessment. The affected population has the right to know the risks and the health problems that possibly are related to the exposure to the event. Also, performing a disaster health outcome assessment might serve as a signal of recognition of the problems of the survivors.

Disaster decision-makers benefit from the information both in the acute phase and in the recovery phase. When a disaster health outcome assessment is performed, information will be available about the health problems among the survivors. After future disasters, decision-makers also will benefit from the results of a disaster health outcome assessments that have been performed previously.

The public health community as a whole, will benefit from performing a disaster health outcome assessment, since it provides information that is useful for the different aspects of disaster management.

Disaster health outcome assessment provides useful information for medical and mental health care professionals. By providing information about the nature, prevalence, and course of health problems, the healthcare workers can anticipate the health needs and requirements of the affected population.

#### Conclusions

Although clinicians and emergency healthcare workers must focus on acute care during disasters, it is important to realize that the disaster is not over when the acute care has been provided. Instead, disasters will cause many other health problems and concerns such as infectious diseases and mental health problems. For that reason, it also is important to approach disasters from a public health point of view. This means that different aspects of disaster management should be considered such as matching available resources with defined needs, prevention of further adverse health effects, implementation of disease-control strategies, risk assessment and communication, evaluation of the effectiveness of the application of these strategies, and the improvement in contingency planning for future events. Disaster health outcome assessment can contribute to reaching these disaster management objectives.

During the 15WCDEM, experts in the field of public health and disaster epidemiology have discussed disaster health outcome assessment during several interactive sessions. Consensus has been reached about the definition, the objectives, and the benefits of disaster health outcome assessments. A disaster health outcome assessment is defined as a systematic examination of the health problems and health needs in a population affected by a disaster. Although we do not advocate for performing a disaster health outcome assessment after each single event, a disaster health outcome assessment is useful to provide information about the health problems and health needs of the survivors. Different main objectives of disaster health outcome assessment have been described: the provision of health care information, the provision of health care policy information, and the contribution to the knowledge and evidence of disaster health outcomes. It has been recognized that several stakeholders might benefit from the information obtained from a disaster health outcome assessment such as politicians, disaster decision-makers, public health authorities, mental and medical health care workers, as well as the survivors themselves. Therefore, a health outcome assessment should be considered after each major incident or disaster.

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