Disasters requiring international action are occurring with increasing frequency and expenditures on emergency relief are absorbing significant proportions of development aid. Although no accurate records are maintained on emergency relief, incomplete reports from national and international agencies estimate relief disbursements at over US$1,000 million each year. The Sahelian famines of the early 1970s, the earthquakes in Tangshan (China) (1976), Mexico (1985) as well as the Armero volcanic eruption demonstrated the need for a professional approach to mass emergency responses and the importance of preparedness in developing countries. In addition, there has been a significant increase in mortality in nearly all types of disasters between the periods 1960-1969 and 1970-1979. The mortality rate increased from 750 per event in the previous decade to 4,871. (Table 1). This increase is probably largely due to rampant urbanization, environmental degradation and population pressures on land (1). Finally, the long-term consequences of acute nutritional stress resulting from famines or harvest loss in floods and cyclones, waterborne diseases and disability are rarely assessed and addressed by emergency programmes.

As a result of current inefficiencies in the approach to health management in disasters, the ever-increasing expenditures have not had any visible results in attenuating or preventing the ravages of natural disasters in the developing world. The handling of relief as purely charitable exercises, providing whatever aid is readily available regardless of needs, has characterized emergency aid. Health response in emergencies has been typically ad hoc action that is generally inappropriate and usually late. Today, field agencies, donors and national governments recognize the need for rationalizing the response to emergencies so that the needs are assessed correctly and on time (2). The importance of preparedness, especially regarding the availability of information necessary for planning rapid response and serving as early warning signals, has been identified as a key element in the improvement of health management in disasters (2).

**Differential impact of natural disasters and the relevance of an epidemiological approach**

The impact of disasters on populations varies according to the type of disaster, but specific population subgroups also differ in their vulnerability to disaster impact. A greater increase in the lethality impact of some disasters has been observed. For example, earthquakes have shown the greatest increase in mortality in the last two decades. When aggregated over countries, mortality and morbidity from disasters seem to be significantly higher for countries with a low GNP than for more affluent countries, even when controlled for population density (Table 2).

Table 3 presents data from two different earthquakes, one in Managua (Nicaragua) and the other in San Fernando Valley, California. The earthquake in California resulted in 80 deaths, while the smaller quake in Managua left over 5,000 dead. Although many other factors besides seismic intensity and socioeconomic factors influence the number of fatalities and injuries from an earthquake, this table gives some indication of the significant influence of socioeconomic conditions on the mortality and morbidity resulting from earthquakes.

The risk of disaster-related mortality and morbidity is also determined by demographic characteristics. Figs 1 & 2 present data from selected disasters where the vulnerability of older children to mortality was substantially higher than other age groups. De Bruycker et al. (4) in their study of the earthquake in Campania (Italy) also observed that children between 5 and 9 years were at higher risk of injury and death than smaller children. This could be explained by the fact that parents take care of small children in crisis

---

### Table 1. Changes in Disaster Mortality Between the Periods 1960-1969 and 1970-1979

<table>
<thead>
<tr>
<th>Disaster - Catastrophe</th>
<th>Deaths/event - Décès/Événement</th>
<th>Mortality per 1,000 exposed - Mortalité pour 1,000 personnes exposées</th>
<th>Importance of change*</th>
<th>Importence du changement*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Famine</td>
<td>202</td>
<td>2,311</td>
<td>0.5</td>
<td>9.5</td>
</tr>
<tr>
<td>Flood - Inondation</td>
<td>158</td>
<td>213</td>
<td>4.5</td>
<td>3.0</td>
</tr>
<tr>
<td>Cyclone</td>
<td>88</td>
<td>2,291</td>
<td>43.0</td>
<td>122.7</td>
</tr>
<tr>
<td>Earthquake - Tremblement de terre</td>
<td>750</td>
<td>4,871</td>
<td>262.5</td>
<td>324.7</td>
</tr>
</tbody>
</table>

---

* Key: — decrease; + 1-2 fold increase; ++ 2-5 fold increase; +++ 5-10 fold increase; ++++ 10 fold-increase. — Légende: — diminution; + augmentation de 1-2 fois; ++ augmentation de 2-5 fois; +++ augmentation de 5-10 fois; ++++ augmentation de 10 fois.

Figures indicate only those deaths directly attributable to the famine - Les chiffres indiquent que les décès directement attribuables à la famine.

Adapted from: Office of Foreign Disaster Assistance, USAID annual reports, various years - Adapté de: Office of Foreign Disaster Assistance, rapports annuels de l'AID des États-Unis d'Amérique, diverses années.
TABLE 2. DISASTER MORTALITY BY LEVEL OF ECONOMIC DEVELOPMENT

<table>
<thead>
<tr>
<th>Mortality – Mortalité</th>
<th>Economy – Économie</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low income – Faible revenu</td>
</tr>
<tr>
<td>Per event – Par événement</td>
<td>3 300</td>
</tr>
<tr>
<td>Per 1 000 population – Pour 1 000 habitants</td>
<td>69</td>
</tr>
<tr>
<td>Per 1 000 km² – Pour 1 000 km²</td>
<td>48</td>
</tr>
</tbody>
</table>

Source: Adapted from reference (1) – Adapté de la référence (1).

TABLE 3. COMPARISON OF CHARACTERISTICS OF EARTHQUAKES IN MANAGUA (1972) AND SAN FERNANDO VALLEY, CALIFORNIA (1971)

<table>
<thead>
<tr>
<th>Disaster characteristics – Caractéristiques de la catastrophe</th>
<th>Managua</th>
<th>San Fernando Valley</th>
</tr>
</thead>
<tbody>
<tr>
<td>Richter scale reading – Degré de magnitude sur l’échelle de Richter</td>
<td>5.6</td>
<td>6.6</td>
</tr>
<tr>
<td>Extent of destruction (Mercalli Intensity Range VI-VII) – Extendue des destructions (VI-VII sur l’échelle d’intensité de Mercalli)</td>
<td>100 km²</td>
<td>1 500 km²</td>
</tr>
<tr>
<td>Population in affected area – Population des zones touchées</td>
<td>420 000</td>
<td>7 000 000</td>
</tr>
<tr>
<td>Dead – Morts</td>
<td>5 000</td>
<td>60</td>
</tr>
<tr>
<td>Injured – Blessés</td>
<td>20 000</td>
<td>2 540</td>
</tr>
</tbody>
</table>

* The Richter scale for expressing the intensity of an earthquake ranges from 0 to 8 – L’échelle de Richter, qui exprime la magnitude d’un tremblement de terre, va de 0 à 8.

Source: Reference (B) – Référence (B).

FIG. 1

AGE-SPECIFIC MORTALITY, SUMPANGO EARTHQUAKE, GUATEMALA, 1976

MORTALITÉ PAR ÂGE, TREMBLEMENT DE TERRE DE SUMPANGO, GUATEMALA, 1976

conditions while they expect the older children to take care of themselves. Guha-Sapir et al. (5) noted similar vulnerability patterns in a survey of affected communities in Chad during the 1985 famine. Mortality was higher among children >2. They concluded that infants were protected against the decrease in food intake by being breastfed while older children were mistakenly expected to be able to secure their own food. The study also noted the increased vulnerability to famine of specific occupational groups within the community.

Studies on risk for disaster-related mortality and morbidity have identified factors linked to population density (3), structural quality (6), time of strike (4) and intensity of seismic activity (7). However, the risk of mortality and morbidity in disasters is clearly not only a function of physical characteristics of the event but is also determined by the prevailing socioeconomic and health conditions of the affected community (8). The differential health impact of disasters on a community indicates that the potential for efficient and accurate rapid assessment techniques can

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be developed using indicators related to death and injury and robust sentinel surveys.

Inefficiency of health relief and role of better assessment

Recently, the repeated disasters in sub-Saharan Africa and in South Asia (in particular, Bangladesh) and the massive international operations that they have entailed, have raised the issue of preparedness of local communities and efficiency of response. As a result of this attention, many different aspects of disaster management have come to light and information has become a major issue. In the last decade, the need for information has crystallized in two main areas: (i) early warning systems for famines became a central issue for famine control and prevention; (ii) methods for rapid assessment came to the forefront for all emergency interventions. This interest in rapid assessment subsequently revealed the inappropriateness of relief in terms of time delay and content. The neglect of proper assessment of needs tended to produce health relief founded more on rumour than on fact and therefore led to inefficient and inappropriate use of limited health resources.

Until recently emergency response, despite sufficient funds and goodwill, has consistently been late and inappropriate, mainly because of inadequacies in rapid assessment. Relief commonly arrives well after the first crisis has passed and continues to arrive beyond the period of need. As a consequence of this continuously lagged response, relief remains largely irrelevant. Finally, when the long-term effects begin to manifest themselves, relief dries up altogether, since these needs were not assessed during the emergency period.

The arrival of large quantities of inappropriate medications, standard relief articles (such as blankets, clothes), surgical and anaesthetic teams is a direct result of political or humanitarian pressures for action. Decision makers are unable to wait for long-drawn-out assessment results, and any available materials are sent. Medical teams and relief supplies that are not required result in logistical backlogs and take time and resources for storage, inventory and sorting. Drugs require classification, storage and occasionally, destruction. Relief personnel require housing and supervision. Volunteers require coordination. This can take valuable time and resources away from the main objectives of preventing and mitigating further deaths and damage. For example, on average 60 agencies arrived each week in Bangladesh over a period of four months following the 1988 floods. While these cases sound anecdotal, they unfortunately characterize the profile of the majority of relief aid today. The urge to send medi-

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\[ FIG. 2 \]

AGE-SPECIFIC MORTALITY DURING TWO EARTHQUAKES (NICARAGUA 1972 AND GUATEMALA 1976)

TAUX DE MORTALITÉ PAR ÂGE LORS DE DEUX TREMBLEMENTS DE TERRE (NICARAGUA 1972 ET GUATEMALA 1976)

<table>
<thead>
<tr>
<th>Town/ville</th>
<th>Number of deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nicaragua 1972</td>
<td>Managua N = 158</td>
</tr>
<tr>
<td>Guatemala 1976</td>
<td>Patzicia N = 377</td>
</tr>
<tr>
<td>Guatemala 1976</td>
<td>Sumpango N = 244</td>
</tr>
<tr>
<td>Guatemala 1976</td>
<td>Santa Maria Cauque N = 78</td>
</tr>
</tbody>
</table>

\[ \text{Age-specific mortality rate/100} = \text{Taux de mortalité par âge/100} \]

\[ \text{Age (years - années)} \]

\[ \text{Number of deaths} \]

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\(^a\) Blankets sent to India following the 1976 floods were donated to Nepal in 1982 and redonated to India in 1987; relief for the victims of the Mexico earthquake included contraceptives and high-heeled shoes.
The teams returned home 11 days later never having dismantled their field hospitals or treated anyone. (G. D’Alemanque, personal communication, 1989). More recently, an unspecified request in December 1989 for blood and plasma for Romania generated US$ 5 million in donations from several European countries by mid-December. No agency considered the need for an assessment of the real requirements. At the end of December, products worth US$ 4 million remained unused. Similarly, 20% of the medication sent to Armenia had passed its expiry dates on arrival, was soon to expire or was of no use in an emergency (9).

Information needs and assessment procedures in disasters

Information needs and assessment methods in disasters depend largely on the type of disaster and the time at which the assessment is made. Natural disasters which have a significant impact on humans may be classified into two categories for this purpose:

- **rapid onset** (little or no advance warning): earthquakes, flash floods, cyclones, high winds;
- **slow onset** (at least some advance warning): floods, famines, epidemics, civil strife, refugees, displaced persons.

Information needs may also be categorized into phases corresponding to the evolution of the process:

- baseline information phase;
- postimpact information phase: immediate relief information secondary relief information;
- rehabilitation information phase;
- evaluation information phase.

The time phase defines the detail and scope of the assessment.

The need for information and the choice of assessment techniques are determined by the rapidity with which the results are required and the time phase of the disaster process in which the assessment is being done. Ideally, baseline information should reflect normal circumstances, i.e. the predisaster period. This body of information should include those items which although labour-intensive, time-consuming or painstaking to collect provide essential input to needs assessment and the planning of relief operations. Examples of such information are: demographic characteristics, agricultural or meteorological data and prevalence data of diseases that could directly or indirectly be affected by the disaster (10). Often these data are not available.

A needs assessment undertaken in the immediate postimpact period will focus on lifeline needs and prevention of impact-related mortality. In the secondary phase, the assessment will address longer-term shelter, food and health care. Subsequently, the development of sentinel surveillance systems and immunization programmes will also be added to the aims of the assessment.

The success of an emergency assessment can be greatly enhanced by the availability of baseline information. For example, identification of nutritional priority groups in postflood conditions requires some knowledge of the normal nutritional status of the population.

Similarly, the assessment of increased incidence of malaria or diarrhoeal disease after cyclones would be facilitated if routine surveillance data were available (Figs 3 & 4). Such baseline data, together with population characteristics, would enable the assessors to estimate the epicurve and propose appropriate action. Therefore, areas which are prone to recurrent emergency situations need to be encouraged to develop sentinel surveillance systems which will allow the required baseline information to be collected without overburdening health workers.

The endemic disease profile of the affected community, its predisaster health status and infrastructure will determine to a large extent the content and methodology of an assessment. The predisaster nutritional situation and cropping pattern will determine actual and potential food needs. Loss of harvest (actual or potential), salination of arable soil, loss of tools of trade could all eventually lead to a severe food crisis in poor, agricultural populations. Emergency assessment would have to evaluate these risks and propose provisions against these eventualities.

The range of what can be achieved by rapid assessment in emergencies is best appreciated by examining the type of damages they create. Box 1 shows the common effects on environmental health services caused by the four most frequent natural disasters.

Rapid assessment in emergencies: current practices

The rationale for rapid assessment is the need for a rapid response. The inevitable loss in accuracy, completeness and reliability in rapid methodologies can only be justified for this reason. In most natural disasters, the time frame for assessing immediate health needs is a matter of days. Some, such as earthquakes or cyclones, require the most immediate assessment within 24-48 hours. This stringent time constraint has been justified by studies such as those by De Bruycker et al. for Italy (4) and Glass et al. for Guatemala (6), in which the majority of the deaths due to the earthquake occurred within the first 48 hours (Fig. 5).

**Purpose and common use of data collected by rapid assessment in emergencies**

The purposes of undertaking a rapid assessment in any emergency situation are:

- determination of the magnitude of the disaster;
- measurement of present and potential impact;
- assessment of resources needed, including local response capacity;
- planning of appropriate response.

Ideally, as described above, an initial survey is first undertaken for immediate needs. The time required for an initial assessment varies with the type of dis-

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Among the different emergency situations, two specific areas have been relatively well examined. These are rapid health assessment among refugees and rapid nutritional assessment. Assessment techniques for acute natural disasters still remain fragmentary and ad hoc. Response to epidemics tends to be extreme, involving either launching a full-scale epidemiological investigation, at the termination of which the epidemic has burnt out, or providing unsuitable supplies which happen to be available at the time.

Rapid assessment in food-crisis situations

Rapid assessment of nutritional status has been relatively well studied by many researchers. In particular, Trowbridge et al. (11) and more recently, Manley et al. (12) have published methodologies particularly adapted to rapid assessment. In the
### Box 1. Common effects of natural disasters on environmental health services

<table>
<thead>
<tr>
<th>Service</th>
<th>Most common effects</th>
<th>Earthquake</th>
<th>Hurricane/tornado</th>
<th>Flood</th>
<th>Tsunamis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water supply and wastewater disposal</td>
<td>Damage to civil engineering structures</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Broken mains</td>
<td>+++</td>
<td>++</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Power outages</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td></td>
<td>Contamination (biological or chemical)</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Transportation failures</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Personnel shortages</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>System overloading (due to shifts in population)</td>
<td>+</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Equipment, parts and supply shortages</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td>Solid waste handling</td>
<td>Damage to civil engineering structures</td>
<td>+++</td>
<td>++</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Equipment shortages</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Personnel shortages</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Water, soil and air pollution</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td>Food handling</td>
<td>Damage to food preparation facilities</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Transportation failures</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Power outages</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Flooding of facilities</td>
<td>+</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Contamination/degradation of relief supplies</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td>Vector control</td>
<td>Proliferation of vector breeding sites</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Increase in human-vector contacts</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Disruption of vector-borne disease control programmes</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td>Home sanitation</td>
<td>Destruction or damage to structures</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Contamination of water and food</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Disruption of power, heating, fuel, water supply or waste-disposal services</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Overcrowding</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

+++ severe possible effect; ++ less severe possible effect; + least or no possible effect.

Source: Reference (21).

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**FIG. 5**

**SURVIVAL CURVE OF VICTIMS IN THE 1980 EARTHQUAKE (CAMPANIA, ITALY)**

**COURBE DE SURVIE POUR LES VICTIMES DU TREMBLEMENT DE TERRE DE 1980 (CAMPANIE, ITALY)**

![Survival Curve Graph]

- **Time (Lib_{50}) = 8 h.** - Temps (Lib_{50}) = 8 h.
- **Cumulative number of trapped people extricated** - Nombre cumulatif de personnes extraites des décombres.
- **Cumulative number of people extricated alive** - Nombre cumulatif de personnes extraites vivantes.

N = 548

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majority of cases, rapid assessment of nutritional status is required for drought or other severe food-shortage situations. The aims of assessment in these cases are to: (i) confirm that a nutritional emergency exists and estimate the number of those severely affected; (ii) assess how severe the food crisis is likely to become in the short and medium term; (iii) identify the groups most affected and the risk factors that could potentially worsen the status; and (iv) assess the need for a more detailed evaluation.

In nutritional crises or disasters resulting in food shortages, anthropometric indicators, principally weight-for-height, height-for-age, weight-for-age and mid-upper-arm circumference, have been used and tested for their potential. The field inadequacies of age-based measurements have been discussed by Bairagi et al. (13), Chen et al. (14) and others. Bairagi et al. estimates the extent of bias in age misstatement to be serious enough to invalidate many results. Trowbridge & Staehling (15) and Guha-Sapir (16, 17) have examined the sensitivity and specificity of these indicators vis-à-vis their cut-off points. There is general agreement that arm circumference (at 125 mm) provides a quick and sensitive assessment of undernourished children aged 12-60 months. However, the robustness of this indicator with regard to the cut-off point is low. Small shifts in the threshold generate major changes in false positives and false negatives, making the tool questionable in field conditions.

Rapid health assessment among displaced persons

Displaced persons include both refugees and internally displaced persons. The aims of a rapid assessment of displacement of populations are to: (i) assess the magnitude of the displacement; (ii) assess the major health and nutrition needs of the displaced population; (iii) initiate a health and nutritional surveillance system; and (iv) assess local response capacity and immediate needs.

Displaced populations, especially those fleeing from drought, have the most wide-ranging and pervasive health implications. Drought-related displacement usually involves groups severely undernourished and physically exhausted. The environmental and social conditions in which they find themselves following displacement are particularly deficient and chaotic. Health-needs assessment in these situations is extremely difficult and the ranking of priorities doubtful.

As far as rapid assessment is concerned the cause of displacement is not entirely irrelevant. The risk of certain diseases (for example malaria) is higher if the community is moving from a nonendemic to an endemic region. Glass (6) reports on the elevated incidence of malaria morbidity and mortality among refugees arriving at the Sa Kao camp at the border between Thailand and Cambodia. The arrival of these refugees from a malaria-free zone into an endemic area resulted in a health situation that was highly vulnerable to outbreaks of the disease. If the displacement is motivated by drought, it is likely that the population will be seriously malnourished and the demographic profile distorted in favour of females, without males or a disproportionate number of very old and very young. This is because, as the food situation deteriorates over time, the adults leave home to search for work or food and the families then move on their own, when the village decides to move. Civil war or returnees, such as the ones seen on the frontlines of Southern Africa (e.g. Botswana, Mozambique, Zambia and Zimbabwe), are frequently in good health and nutritional condition when they arrive, but if health services are not quickly organized, their status can deteriorate rapidly. These background conditions can determine the focus of an assessment mission and the types of methods to use.

Since refugee health problems have the dubious distinction of encompassing all aspects of a normal health structure with some additional specificities, assessment in these situations is essentially a telescoped version of the planning of a health programme in five days. The worst-case scenarios are those already observed in the 1983-1984 droughts of Ethiopia, Sudan and other Sahel countries. The emergency consisted of the sudden arrival of 20,000-40,000 persons in an advanced state of destitution, with high rates of disease and malnutrition and no apparent means of survival. Rapidity of the health-needs assessment in these conditions takes on a different significance and the methods or techniques are selected according to different criteria.

Rapid assessment in acute natural disasters

Rapid assessment in this type of disaster tends to focus on mortality and expected morbidity estimations. The types and quantities of injuries and subsequently the need for food and disease control, especially in floods or cyclones, typify the assessment procedures. Earthquakes do not generally produce a situation in which the health of the surviving population is severely affected, although the death rate is high and fast, and survival curves level off within 24-48 hours of the impact. Most deaths occur in the first 6-10 hours and those surviving are generally unaffected. Injuries and trauma among survivors are relatively limited and are also concentrated within the first couple of days. The survivors among the affected population are healthy and require shelter, food and water.

Floods and cyclones have greater health implication. Besides mortality and morbidity from immediate impact, waterborne diseases, respiratory tract infections and in the longer term, decreases in nutritional status have been observed (16, 17).

Overall, the main public health concern following disaster has been the fear of disease as a secondary consequence to the acute natural disaster. This has not been observed to occur very frequently. There are, however, some epidemiological determinants that influence the risk of an outbreak after an earthquake, flood or cyclone. These are:

- the endemic levels of disease in the community;
- ecological change;
- population displacement;
- population density;
- interruption in health services;
- disruption of sanitary facilities.

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1 Guha-Sapir, D. Nutritional and non-nutritional impact of supplementary feeding programmes. A study in India. Department of Epidemiology and Preventive Medicine, University of Louvain. 1990. (Doctoral thesis).

Rapid assessment in epidemics and disease outbreaks

The principal aims of a rapid assessment in epidemics are to: (i) confirm that an epidemic exists or is threatened; (ii) estimate its geographical distribution; (iii) estimate its health impact and; (iv) identify local capacity to control transmission and reduce mortality. The usual approach in epidemics has been to carry out a classical epidemiological investigation which normally takes 2-3 weeks to complete. In fact, if an epidemic is already in place, as it usually is before any emergency action is taken, the following information may be sufficient for an assessment. Firstly, the establishment of a working case-definition is essential for any further field investigation and case identification. Secondly, the geographical distribution of the epidemic should be defined not only from hospitals, but also from new graves and a review of death certificates. Improved recognition and better reporting of disease due to rumours of an epidemic can artificially increase the number of cases when there is no real increase. Thirdly, the mode of transmission of the disease which will determine the control mechanisms should be established. An investigation of the type and source of infection, severity of illness and prognosis will also be required for an initial assessment. The data on the sample of cases should ideally be mapped by community groups and geographical regions to filter out high-risk areas or groups. Assessment methods in epidemic situations will use survey (hospital- or population-based depending on the expected prevalence of the disease) and laboratory methods. Time-series data can be important in this context for identifying the location on an epicurve.

Limitations and weaknesses in present methods and approaches

Currently, the methods used for rapid assessment are variations of those used for normal assessment or epidemiological investigations. The variations are generally ad hoc, depending entirely on the assessor's individual capacities, the time frame and the donor mood. There is little use of standardized methods. Information on assessment techniques used to arrive at the final conclusions and the biases in the methods have rarely been provided. However, experience has shown that among the techniques used, there are some sources of error and bias that are revealed repeatedly in emergency health assessment.

An initial assessment often focuses on what are thought to be the most affected areas, rather than on an overview of the entire disaster area. There are two main problems with this approach. Firstly, the areas identified as most affected may not, in fact, be the worst-affected. Frequently, the selection of sites as the worst affected results in a sample biased by the source of information. Secondly, by selecting the hardest hit areas only, it may be difficult to assess the full impact of the disaster. The source of information on morbidity may also severely influence morbidity estimates. Information from health providers may not be accurate or representative. On the one hand, injuries may be underreported because of poor record keeping or because health facilities may be inaccessible to many of the injured. On the other hand, injuries may be overreported because the same injuries are registered or counted several times.

The problems encountered in obtaining information on injuries can be illustrated by the following experiences of needs assessment after the Tangshan earthquake in China in 1976. It was suggested that the low levels of head and chest injuries recorded in the hospital registers were mainly due to the fact that persons with this type of injury died on impact or soon thereafter. Thus, the morbidity profile of the earthquake was based only on those surviving several days in the hospital, revealed artificially low rates of trauma to the upper torso. When compared to other more complete injury profiles reported by Beinin (17), it is clear that head and chest injuries are the predominant categories of immediate health impact in earthquakes.

Other errors in the immediate impact phase arise from partial information on mortality. An important consideration in using mortality data is that it is not as useful for immediate relief as the evolving injury pattern. However, for assessing future need priorities, it is useful to determine leading causes of death and associated risk factors in specific types of disasters. In rapid-onset disasters, it is particularly difficult to estimate the number of bodies that have not been recovered. For this reason, reported mortality is often limited to the number of bodies recovered, thus underestimating true mortality. The differentiation between mortality estimates based on body counts and those which include persons missing is critical for any population-based estimate. In addition, while it is easier to attribute the event as the cause of death in acute, rapid-onset disasters such as earthquakes and cyclones, this is more problematic in slow-onset disasters such as famines or floods. The deaths occurring as an indirect effect of the disaster, such as deaths due to diseases aggravated by malnutrition, may be attributed to the drought by some definition and not by others. This definition of attributed cause of mortality or morbidity has serious implications for how need is assessed and response planned. In slow-onset disasters, the problem of excluding that portion of morbidity and mortality that would have occurred in the normal course of events is also significant.

Bias can be a serious weakness in rapid assessment made during emergencies. Often, sample sizes are too small to provide a proper sampling frame for a survey, and a random sample cannot be used. The sample must be used. Sample representativeness can be increased in several ways. Besides avoiding markets, centres of towns or main roads, the range of the health impact can be estimated by selecting the most affected and least affected villages (according to a local authority). This can be further refined by asking different individuals, such as an official, a religious leader, a local political figure, government official, non-governmental organization, missionary, for information on worst affected and least affected. If there is no clear consistency in the replies, several worst-affected areas should be included in the survey. Within the village, random starting points should be used and contiguous houses avoided. Urban centres should be treated differently from rural centres, since living patterns are different. Some marginal groups should be specially sampled, such as nomadic settlements, slums, or forest and mountain people.

There are other sources of bias leading to low representativeness. The timing of surveys, for example, can produce a misleading sample. Surveys done at certain times of the day will oversample women or

men or the elderly because of work, school and other occupational patterns. Information based on hospital or health care station records can be very misleading, except in situations where the prevalence of the main health effect is very slow (e.g. outbreak of cerebrospinal meningitis). In other situations, the hospital- or health station-based information will reflect only those who have actively sought care. Since those who seek care are not necessarily those who need it, assessment results can present an unrealistic picture of the affected population, and relief efforts may miss the mark entirely.

Conclusions and necessary research

In recent years, a few epidemiological studies have been published that have contributed significantly to the development of the rapid assessment techniques proposed by WHO, and have furthered the cause of robust techniques for use in the field. Survey techniques have been proposed based on experience, particularly in sudden, massive population-displacement situations. Epidemiological and other indicators that are easy and quick to measure have also been examined for their potential in reflecting health needs (18-20). However, much of this knowledge today is based on occasional field experience, and relatively little systematic and scientifically-controlled research has been undertaken to validate the methods. The typical conditions of time and resource constraints under which rapid assessments take place in emergencies make sound, field-tested methods critical.

In emergencies, perhaps more than in any situation, the consequences of errors are very serious. Inadequate assessment in a rapidly-evolving situation such as a flood or famine implies significant numbers of lives lost and serious long-term health consequences. Since disasters in developing countries generally affect large groups of population, the individualized approach to emergencies as practised in Western countries is inappropriate.

An important methodological issue in surveys for rapid assessment in the epidemiological context is the need for a reliable denominator. This is evidently easier said than obtained, especially in rapidly-evolving situations. However, the significance of a valid denominator should not be underestimated. The definition of the geographical area and the population affected is essential to any rapid assessment initiative. Creative methods such as counting the number of houses without roofs by an aerial survey in an earthquake and multiplying it by the average family size of the country would already provide a working figure for the total number of homeless. Standard coefficients (for example, 0.15 for proportion of children <5) would provide further estimates for infants and small children for feeding and immunization planning.

In camp conditions, a method for estimating deaths prior to having a proper registration system established has been used by Toole & Waldman (19). It consists of posting a guard around the clock at the burial place to note all bodies brought in by relatives. Alternatively, in a camp where no burial facilities were available and the dead were removed by an external contractor, the epidemiologists responsible for assessment paid the contractor a flat fee to report the numbers and some basic details on the bodies he transported. Mortality assessment can be very problematic in many emergency situations, since food rations or other relief goods are supplied on a per capita basis. This naturally discourages families from reporting deaths for fear of losing part of their share.

Finally the choice of sampling methods for the assessment (household- or institution-based) will depend on the expected prevalence of the disease or phenomenon in question. At a rate of 5 cases per 1 000 at the peak of an epidemic, as expected in epidemic meningococcal meningitis, a household survey is meaningless. For yellow fever, on the other hand, a household survey is indicated, but since the aim is to cut off transmission and improve protection rather than prevent mortality, much effort for an accurate assessment of the number of cases may be of little practical value for mounting an immediate emergency response. The severity of a disease and therefore its duration can also lead to misleading conclusions in rapid assessment missions. An example of such misjudgement is provided by the rapid assessment mission sent to Chad in 1973, during the height of the famine. The report of the team of experts concluded that no serious malnutrition existed and there was no cause for alarm. It was reported later, after examination of data over a longer period than was considered by the rapid assessment team, that the children most severely malnourished were dying very quickly at the peak of the famine. Therefore only the survivors (moderately or mildly malnourished) were available to be surveyed by the team. This phenomenon of a low-point prevalence of a disease as duration of illness decreases is a pitfall in rapid assessments that could seriously invalidate the results. Sampling methods and survey content should be modified according to the health problem in question and the phase of the emergency (for example, when the rapid assessment is taking place in the epicurve of a meningitis epidemic).

Limited surveys, if properly done, may provide a rough idea of the extent of damage, prevalences and incidences of malnutrition and diseases. The larger the size of samples, the better-designed the survey and the better the results. But in emergencies there is a trade-off to be made between accuracy and timeliness, in addition to accounting for resource and logistical constraints. The most practical view in these circumstances is that being roughly right is generally more useful than being precisely wrong. The delay in reporting the assessment conclusions generally means that relief response will have been initiated without any consideration of the actual needs. This does not by any means imply that spurious methodologies or amateurism can replace rigorous thinking. The use of indicators that do not reflect the phenomena in question or surveying samples that mislead the assessor in the conclusions can create more damage than not taking any action. The challenge is to modify regular methods to fit the constraints of the situation.

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The increase in the number of natural disasters and their impact on population is of growing concern to countries at risk and agencies involved in health and humanitarian action. The numbers of persons killed or disabled as a result of earthquakes, cyclones, floods and famines have reached record levels in the last decade. Population density, rampant urbanization and climatic changes have brought about risk patterns that are exposing larger and larger sections of populations in developing countries to life-threatening natural disasters. Despite substantial spending on emergency relief, the approaches to relief remain largely ad hoc and amateurish, resulting generally in inappropriate and/or delayed action. In recent years, mass emergencies of the kind experienced in Bangladesh or the Sahelian countries have highlighted the importance of rapid assessment of health needs for better allocation of resources and relief management. As a result, the development of techniques for rapid assessment of health needs has been identified as a priority for effective emergency action.

This article sketches the health context of disasters in terms of mortality and morbidity patterns; it describes initial assessment techniques currently used and their methodological biases and constraints; it also discusses assessment needs which vary between different types of disasters and the time frame within which assessments are undertaken. Earthquakes, cyclones, famines, epidemics or refugees all have specific risk profiles and emergency conditions which differ for each situation. Vulnerability to mortality changes according to age and occupation, for earthquakes and famines. These risk factors then have significant implications for the design of rapid assessment protocols and checklists.

Experiences from the field in rapid survey techniques and estimation of death rates are discussed, with emphasis on the need for a reliable denominator even for the roughest assessment. Finally, the importance of adapting normal epidemiological and statistical methodologies to crisis situations is underlined in order to rationalize the recurrent and substantial expenditures made in response to natural disasters today.

### REFERENCES — RÉFÉRENCES


