THE IMPACT OF NATURAL DISASTERS: A Brief Analysis of Characteristics and Trends

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Introduction

Most natural disasters that occur frequently may be classified into four main categories: floods, earthquakes, cyclones and famine. Other catastrophic events, such as land slides, avalanches, snow storms, fires occur at rarer occasions and threaten smaller proportions of the populated world. The destructive agents in the above categories are wind, water (a lack or excess thereof) and tectonic force. While all of these cause structural damage, their mortality and morbidity effects are varied both between them and over time. The disaster cycle can be differentiated into five main phases, extending from one disaster to the next. The phases are: the warning phase indicating the possible occurrence of a catastrophe and the threat period during which the disaster is pending; the impact phase when the disaster strikes; the emergency phase when rescue, treatment and salvage activities commence; the rehabilitation phase when essential services are provided on a temporary basis; the reconstruction phase when a permanent return to normality is achieved.[4] The disaster-induced mortality and morbidity differ between these phases and are also a function of the prevailing health and socio-economic conditions of the affected community. As a result of this, global statistics on disasters seem to indicate a significantly higher frequency of natural disasters in the developing countries than in the industrialized world.

Characteristics of Natural Disasters:

It is helpful to start by locating the four main types of disasters on relative scales of lethality, predictability, onset time and impact scope. This ranking provides some guidance towards understanding the variation in mortality impact observed among disaster events across time and space. Figure 1 displays the four scales with the location of each disaster type. Although drought-related famines are a very special class of disasters, and often do not present a comparable picture, it may nevertheless, be included in this diagram.

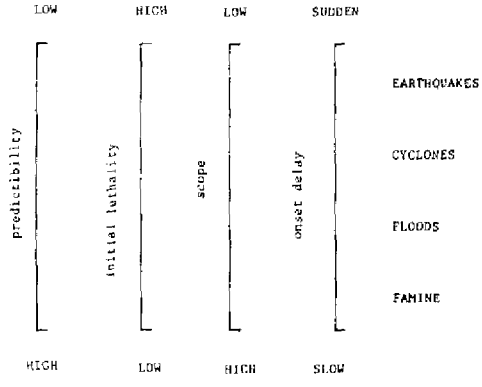

Figure 1. Ranking of Principal Disasters on relative scales of predictability, initial lethality, scope and onset delay.

Famines are disasters of high *predictability*. With the exception of the Great Bengal Famine of 1941-43, almost all the following important famines, certainly the ones of Sahelian Africa and Ethiopia, were more or less foreseen as impending events. Famines, in fact, provide an excellent illustration of the fact that the knowledge of impending disaster does not imply that a community can or will take responsive action. On the other end of the scale, earthquakes tend to be least predictable, striking with little warning and thus cause enormous human and physical damage. Japan is one of the few high risk countries that have an effective earthquake management program, focusing on warning and evacuation systems that has resulted in spectacularly low human and physical impact from high intensity shocks.[5] For instance, the earthquake of Niigata (16th June, 1964) registered 7.7 on the Richter scale. Although 20,000 houses were destroyed, only 13 people were killed and 315 injured. Due to the quality of its preparedness programs registering a high number of seismic shocks, Japan suffers very limited mortality.[1]

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In terms of *lethality*, earthquakes present the greatest risk of death to those affected (Table 1). The chances of dying if one is within the scope of the quake is about 100 times higher than the probability of dying in cyclone. *Onset delay* is also the shortest in earthquakes, which is interrelated, to a certain extent, with its low predictability. Earthquakes, generally, strike with little warning and current seismic technology does not have acceptable prediction capability. Famine, on the other hand, has a slow build up period, sometimes up to a year or more, before it reaches acute emergency proportions. Floods can be somewhat ambiguous in their onset characteristics. They can be slow-developing and fairly predictable such as the annual floods in Eastern India Gangetic plains or in the Itajai River basin in Brazil, causing regardless, a certain amount of deaths and damage [2] Acute and catastrophic floods are those, usually generated by cyclones or tsunamis, such as the ones in Phillipines (1984) and Bangladesh (1985). Floods, relative to other disasters cause somewhat lower mortality but the *scope* of damage is generally wider and more pervasive such as that in famines.

TABLE 1

Changes in Disaster Mortality Between the Periods 1960-69 and 1970-79

DISASTER TYPE	DEATHS PER EVENT		MORTALITY (per 1,000 exposed)		IMPORTANCE OF INCREASE
	1960-69	1970-79	1960-69	1970-79	
Famine	202	2,311	0.4	9.5	++++
Floods	158	213	4.5	9.5	—
Cyclones	88	2,291	43.0	122.7	++
Earthquakes	750	4,871	262.5	324.7	+

Adapted from: U S Office of Foreign Disaster Assistance Annual Reports Cited in Swedish Red Cross, 1975

Trends in Disaster Mortality

On a global level, the mortality generated by natural disasters show some interesting tendencies. These form the beginnings of an analytical framework within which specific impacts may be systematically analyzed for robust indicators, efficient needs assessment or preparedness and rehabilitation planning.

The official disaster data reveal two important variations in disaster mortality: a temporal increase and geographical correlation.

Between the two ten-year periods, 1960-69 and 1970-79, a significant increase in *average mortality per event* is noted in all categories except perhaps floods where direct mortality is relatively low in any event (Table 1).

The greatest increase is noted in earthquakes, which takes a quantum leap from one period to the other. This is partially explained by the Tangshan strike of 1976 in China which contributed more than half of the entire death toll. But even omitting the Tangshan quake, the death rate per strike remains as high as 1,780 versus 750 in the previous decade. Population density, structural quality, time of strike and intensity of seismic activity seem to be the main risk factors but they remain unsatisfactory explanatory variables as will be seen later.

The mortality per 1000 persons exposed increases significantly over the two decades (except earthquakes which, being a high risk localized disaster, relatively speaking, does not change much). This increase in the numerator, indicating more deaths as a proportion of those affected, reflects perhaps, the inability of disaster management policies to reduce the vulnerability of a community to successive disasters.

In fact, on the contrary, it seems, despite disaster assistance, that larger groups of the risk region become more susceptible to the next disaster with each successive event.

Geographically, the mortality generated by disasters is consistently and positively correlated to the level of the economy (Table 2).

TABLE 2

Disaster Mortality by Level of Economy

MORTALITY	ECONOMY		
	Low Income	Middle Income	High Income
Per event	3,300	500	125
Per 1,000 pop.	69	28	19
Per 1,000 km^2	48	8	1

Adapted from Swedish Red Cross, 1985.

This table indicates that pre-existing socio-economic conditions and health status of the affected community may be a better determinant of the epidemiological impact than the physical characteristics of the event, such as the Richter scale reading or Mercalli damage. The latter measure, together with all financial estimates of physical damages, are especially misleading due to the higher property values and greater individual acquisition in wealthier communities as compared to poorer communities. These damage estimates are more a reflection of the higher labour costs and better living standards than real damage caused in terms of basic needs.

As seen in Table 2, disaster generated mortality increase dramatically as economies descend the income scale. This trend demands a search for some

less "natural" explanations of disasters and their impact than a kind of natural selectivity in the allocation of disasters to low-income countries.

The 1976 earthquakes of Managua and San Fernando Valley (California) illustrate this point.

In terms of the physical characteristics of the two, the seismic activity level in the California quake was considerably higher, registering 6.6 on the Richter scale versus 5.6 in Managua. It was significantly higher on the Mercalli scale and the California strike directly affected a population 13 times that of Managua (7 million versus 0.5 million).

The mortality in Managua, however, was somewhere around 5,000 deaths as opposed to 60 deaths in California.

Disaster related morbidity and long term impact

The data on morbidity (i.e. injuries and disease) after a disaster is remarkable by its absence or incomparability. The definition of injury is largely unstated and reporting of disease largely incomplete This results in a series of observations on disaster-induced morbidity, partly anecdotal, partly systematic but nearly all fragmentary.

Despite the urgent nature of a post impact disaster situation, it is clear that standardized reporting and data collection is essential for future program efficiency. The importance of such an activity, even during the emergency phase cannot be overemphasized.

Finally, the long term impact of disaster, possibly the most pervasive and destructive phase, manifests itself variously. Disaster induced death and disability of the earning member of a family, death of breeding stock of herdsmen, saltwater flooding of subsistence and marginal farms, loss of capital or tools of trade, loss of mothers of small children, all can create a devastating impact on mortality and morbidity at secondary and tertiary levels

Conclusion

The perspective from which natural disasters have been traditionally viewed triggers, even today, the classic urgent action syndrome—field hospitals, volunteer programs, supply of coffins, spurious medicaments, vaccination campaigns—needs to be reworked. The horizons of disaster relief and rehabilitation should be broadened to allow multi-sectoral considerations in disaster assistance. It has been observed that in the immediate post impact period of large scale disasters, external relief assistance arrives generally too late and is frequently inappropriate.[3] Immediate search, rescue and evacuation is generally undertaken by community members, mainly family, friends and neighbours. Post disaster assistance should focus on building up preparedness and coping mechanism within the community and initiate activities that take into consideration the numerous and important post emergency consequences of a natural disaster.

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