

Disaster Medicine: A Public Health View

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Public health is the branch of medicine which deals with the organization of the local, national, and international resources available to face the most important health problems of the community so as to prevent disease, prolong life, and promote good health.¹

Breadth characterizes the approach taken by public health authorities to the problems associated with community health. This broad-based approach brings together the interests and services of many non-health sectors into the sphere of health care—veterinary, agricultural, engineering, industrial, economic, political, and social. Thus, public health represents a function of government: its role in the prevention of disasters is of primary importance. One should consider how often irreparable environmental, human, and social damage caused by disasters could be avoided or attenuated if organized preventive strategies and measures were established across sectors and aimed at specific risks, besides those involving the whole population.

Knowledge of the territory assumes the same importance in the practice of public health as does the knowledge of the patient in the practice of clinical medicine. It is through knowledge that one can identify the risk factors which threaten the health and safety of the community and so enable it to establish organized strategies and techniques of general and specific prophylaxis aimed at preventing damage to health.

Risk

In human history, risk has undergone considerable transformations in step with the evolution of humanity and with the corresponding advances in scientific and technological knowledge. Only natural risk has remained more or less constant. It is important to emphasize that to every human advance there corresponds an increment (I) of risk from human evolution:

$$D/R = I$$

where: D is human dominion over nature and R is risk. In other words, wherever dominion over nature increases, so, too, increases risk.

In the passage from the primitive age to the agricultural and the industrial ages, instrumental risk and industrial risk have been added to natural risk; today, in the post-industrial age, humanity has succeeded in manipulating the atom, the gene, the brain, and the ecosystem,³ and the risks have multiplied and also are more subtle.³ Obviously, there also are other kinds of incremental risks linked to social and political phenomena, such as terrorism and war.

At this point, a reflection: the fact remains that natural risk continues to exist and often escapes human control; since we are dealing with risks deriving from human activity and, as such, risks that certainly are controllable—all other risks are avoidable, whence prevention. Moreover, through indirect

control mechanisms, preventive interaction can succeed in attenuating even the effects of natural disasters.

Vulnerability Analysis as an Instrument of Prevention

Analogous to what happens in the epidemiology of infectious diseases, three elements or factors are considered in the prevention of disasters: 1) the causative agent; 2) the community exposed; and 3) the territory affected. These three elements constitute a system; for this reason their equilibrium depends on each one of them. Thus, assuming a likelihood that this capacity will fully manifest itself depends on in the characteristics of the population exposed and the territory stricken. If:

$$R = PD$$

where: R is risk, P is the probability of the event and D is the negative effects expected. The vulnerability of a zone tends to be the maximum when the risk is high and the state of preparation and the territory are poor:

$$V = R(I/M)$$

where: V is vulnerability and M is the state of preparedness of the population and the territory. This is equivalent to saying that the vulnerability of a territory and of a population is, with respect to a disaster-causing agent, directly proportional to the risk of the disaster happening, and inversely proportional to the state of organization, and the preparedness of the territory, and to the state of health and preparedness of the community. Full knowledge of these three elements of the system is an indispensable prerequisite for the analysis of vulnerability.

The process must be launched from what in public health is called "community diagnosis," and proceeds by relating the data furnished by community diagnosis to the characteristics of the places in which the community lives. Thus, data and parameters relative to the demographic characteristics of the population constitutes the information which allows the delineation of possible scenarios in the event of disaster. These data and parameters include: health and social indicators; climatic, hydrogeological, and orographical data; data relative to the degree and type of human influence on the environment with particular reference to urban planning, the road system, and the presence, density; and location of industrial sites, thermal and conventional power plants, hydraulic and civil engineering facilities and their corresponding systems; and areas subject to risk from fire or explosion. Consideration of these data can assist with the forecast of the impact of the event on the population.

However, the important point is that imbalances existing in the system can be identified, and so it is possible to intervene bringing within acceptable safety limits the three elements of the system and relationships between them before a disaster occurs.

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Public Health in Disasters

Any kind of disaster is an occasion in which the shortcomings of a population and the problems of the territory dramatically emerge. It is of particular importance to observe that in the occurrence of a disaster, it is not only the human ecosystem that is disrupted but also other, natural ecosystems.⁵ It is possible then, to find an imbalance, for instance, in the microbial communities that populate other animal types, such as insects or rodents, which in certain circumstances may prevail. This happens because an equilibrium, which under normal circumstances, limits the populations of these animal types through the action of environmental factors and antagonistic or competitive animal species, is perturbed.

To these factors must be added those relating to the human environment, which in conditions of stress, is particularly vulnerable.⁶

The Most Important Problems

Contamination of Water Supplies—This is the most serious problem. It is well-known that the correct use of water avoids hygiene-related problems and the outbreak of infection. On the other hand, water itself can become the vector of infective agents. In emergency situations, criteria of potability of water cannot be based upon “quality” parameters, but rather on the absence of harmfulness after brief exposure.

Contamination of the Soil—This can happen through defecation onto the soil, the presence of dead people or animals, the discarding of refuse deriving perhaps from the destruction of buildings, or through the damage or breakage of stores and tanks containing dangerous substances. Contaminated soil then can become a considerable risk to underlying aquifers and a repository for dangerous microorganisms, insects, rodents, and other animals.

Contamination of the Air—This occurs in cases of volcanic eruption, war, industrial, chemical, and nuclear accident, and fire. The problems that are present in these cases are related to evacuation of areas downwind of the source of the airborne contamination.

Greater Circulation of Microorganisms—Infectious disease caused by microorganisms can be exacerbated whenever crowded human gatherings of extended duration occur and people are obliged to live under primitive conditions without the necessary means for maintenance of personal and environmental hygiene. The microorganisms which multiply abnormally usually are those already present in the population. If in a given population, a certain infectious disease exists endemically, it is probable that in a disaster situation there will be progression toward an epidemic of that same disease.

Scarcity of Food—This comes about through the destruction of stored food or through contamination. It is less serious than scarcity of water, but in conditions of stress, the people and animals need an adequate energy intake in order to respond better to the greater spread of microorganisms. It is important to

make available non-perishable, high-energy foodstuffs which do not necessarily need cooking, which may be consumed easily, and may be eaten by small children.

Vaccination—Vaccination programs rarely are justified in the course of disasters, given that the immunity conferred is not immediate and that not all vaccines confer a high level of protection. On the other hand, adequate and widespread public education certainly is needed and is efficacious.

Conclusion

The analysis of vulnerability of a territory is of extreme importance both as an instrument of prevention and for emergency services; it should form an integral part of the policies of government of the territory and of the community.⁷

The state of preparation and education for the population are indispensable in order to cope with the emergency, reducing to a minimum unsuitable behaviour or rash actions which could be damaging, and increasing its response capability. Reserves of food, essential material and, above all, water, and the rapid implementation of systems of collection and clearance of liquid and solid waste are the public hygiene measures which must be activated with the highest priority using the simplest means possible.

There is a need to clean up the damaged food stores, agricultural debris, corpses, and refuse so as to reduce the chance of infestation by insects and rodents. A disinfection campaign should be put into action within a few days after the disaster.

Collection and burial or cremation of corpses should be accomplished with urgency and in accordance with local customs and religion. Adequate provision also needs to be made for the disposal of animal carcasses.

Mass vaccination may find useful application, but it must be offered primarily to non-indigenous rescue-workers; the public should be informed that vaccination does not constitute an exemption from scrupulously maintaining proper hygienic practices.

Today, many disasters are caused by human activities, and human activities also can render natural disasters more serious. Therefore, it is necessary that health be considered a factor in determining the environmental impact of a disaster. Health-consciousness, as a prime asset, assumes a high profile in economic and social decision-making and in policy development.

References

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