CHAPTER 9.
FOOD AND NUTRITION

The nutritional status of a population depends on the availability of food, its consumption, and its biological utilization. A natural disaster may affect the nutritional status of the population by affecting one or more components of the food chain depending on the type, duration, and extent of the disaster, as well as the food and nutritional conditions existing in the area before the catastrophe.

Slow-onset disasters such as drought are more likely to affect long-term nutritional status than sudden-onset disasters such as earthquakes and hurricanes. Not all sudden-onset disasters produce food shortages severe enough to cause harmful changes in the nutritional status of the population. The effect of any type of disaster on the nutritional status of the affected population is never immediate. Large-scale food distribution is not always an immediate relief priority, and its long-term implementation may, in fact, produce undesired effects.

To plan and implement successful food relief operations, nutrition workers responsible for humanitarian operations must be familiar with the possible nutritional outcomes of specific types of natural disasters, as well as the food and nutrition situation in the affected area prior to the disaster. A nutrition officer trained in emergency management must be part of the disaster planning and response teams.

The immediate steps for ensuring that a food relief program will be effective include: (1) assessing the food supplies available after the disaster; (2) gauging the nutritional needs of the affected population; (3) calculating daily food rations and needs for large population groups; and (4) monitoring the nutritional status of the affected population.

EXPECTED CONSEQUENCES OF DISASTERS ON THE FOOD CHAIN

Hurricanes, floods, land- or mudslides, volcanic eruptions, and sea surges directly affect food availability. Standing crops may be completely destroyed, and seed stores and family food stocks may be lost, especially if there is no warning period. Volcanic eruptions can cause widespread crop destruction: food crops may be burned, defoliated, and buried under ashfall; reduced photosynthesis resulting from ash clouds limits subsequent production.

Earthquakes, on the other hand, generally have little direct impact on the long-term total availability of food. Standing crops are unaffected, and food stocks can often be salvaged from family, wholesale, and retail stores. However, temporary food problems may result as a consequence of the breakdown of the transportation

and marketing systems. If an earthquake strikes during a labor-intensive period such as harvest, the loss of labor from death or its diversion from agriculture may cause short-term scarcities.

The most likely consequence of any kind of sudden-impact disaster will be the disruption of transportation and communications systems and upheavals in routine social and economic activities. Even when food stocks exist, they may be inaccessible due to disruptions in the distribution system or the loss of income with which to buy food. Destruction of cash crops also will have an effect on the economy of families. When destruction of a greater magnitude occurs, leading to the death of livestock and the loss of crops and stored foodstuffs, the short-term dilemma can leave a more severe, long-term crisis in its wake. Moreover, evacuation and resettlement of communities during the post-disaster period are often necessary, creating foci in which total food supplies will have to be provided for the duration of the encampment. Hospitals and other institutions may require emergency food supplies as well. Livestock may have to be sacrificed if they cannot be fed, and they are likely to die when vast tracts of land are flooded for long periods. While the meat can be used immediately for distribution among the affected population, or salted for later distribution, in the long run it results in food and economic shortfalls.

The effect of disasters on the biological utilization of food, that is, intestinal absorption and subsequent utilization of nutrients, is indirect, and dependent on factors such as the impact of the disaster on the environment, particularly on water supply and sanitation. This is an issue of concern, particularly in regard to gastrointestinal infections since they affect the absorption of nutrients. Other infectious diseases increase the demand for nutrients. These effects are more likely to occur among the young and vulnerable groups. If there is an increase in undernutrition rates among young children soon after a disaster, it will most likely be the effect of gastrointestinal illness rather than actual food shortages. This is something to keep in mind in the implementation of surveillance mechanisms. Outbreaks of infectious diseases are uncommon after natural disasters, especially in the Americas.

POSSIBLE ADVERSE EFFECTS OF LARGE-SCALE FOOD DISTRIBUTION

The decision to distribute large amounts of food, although made at the political level, should be based on the most accurate information available. If unnecessarily large quantities of food are brought into an area, this may hinder recovery. Food distribution requires transport and personnel that may be better employed in other ways, and small farmers may face hardship due to depressed market prices. Perhaps the most serious side effect is that maintaining a population by free food distribution, if not accompanied by essentials such as seeds and tools needed to restart the local economy, may create dependence on relief.

SETTING PRIORITIES

The priorities in alleviating food problems are to: (1) supply food immediately where there appears to be an urgent need, namely to isolated populations, institu-

tions, and relief workers; (2) make an initial estimate of likely food needs in the area, so that steps can be taken toward procurement, transport, storage, and distribution; (3) locate or procure stocks of food and assess their fitness for local consumption; and (4) monitor information on food needs so that procurement, distribution, and other programs can be modified as the situation changes.

IMMEDIATE RELIEF

During the first, usually chaotic, days after a disaster strikes, the exact extent of the damage is unknown, communications are difficult, and the number of people affected seems to double by the hour. Food distribution must start as soon as possible to keep people fed, rather than prevent clinical malnutrition. Given the large variety and small stocks of commodities sent in as aid by governments, agencies, private organizations, and individuals, however, food distribution is initially a day-to-day exercise. Planning nutritionally sensible food rations during this period is impossible. What matters during this "chaotic stage" is to provide a minimum of 6.7 to 8.4 Megajoules (1,600 to 2,000 kcal) per day, per person.

As an immediate relief step, available food should be distributed in sufficient quantity to any group that is at high risk or appears to be wanting, to ensure survival for one week (3 or 4 kg per person). Food may be included automatically, for example, in supplies sent to communities isolated by earthquake or displaced by flooding. Where fuel shortages are likely, it may be better to distribute cooked food such as boiled rice or bread rather than dry food.

No detailed calculations need be made of the precise vitamin, mineral, or protein content of the food distributed in the initial phase, but supplies should be acceptable and palatable. The most important thing to be provided is sufficient energy. If no other items can be obtained, distribution of a cereal alone will be sufficient to meet basic nutritional requirements. When a population can find some of its own food, it may be possible to supply only part of the ration, or one food item that complements the basic or staple food lacking in their available supplies.

ESTIMATING FOOD REQUIREMENTS

As soon as possible after a disaster, a rapid assessment of the food and nutrition situation should be made to get a rough estimate of likely bulk food items needed. This is based on the population affected, its composition, distribution (for example, isolated villages, refugee camps), and locally available foods. This will enable managers to take the necessary steps to locate and procure stocks, storage, and transport. Hoarding is not uncommon and leads to over-response.

In the absence of detailed information, an estimate of food requirements must be based to some extent on judgment in the light of the initial assessment, but it should take into account the following factors: (1) the probable effect of the disaster on food availability (e.g., a tsunami may have destroyed all household supplies); (2) the approximate size of the population affected; (3) normal food supply and variations within the area (e.g., the approximate percentages of the population who are subsistence farmers and those who depend wholly on purchased food); and (4) the impact of seasonal factors. In subsistence areas just before the harvest, for instance,

household and traders' stocks may be depleted and the population may be more dependent on the market.

The nutrition officer should prepare estimates of foods on the basis of a family unit (usually considered to consist of five people) for one week and one month. Logistically, food distribution on a family basis for one month may be considered the most practical approach. The nutrition officer also should prepare estimates of commodities required by large population groups, for instance, on the basis of 1,000 people for one month. Two simple and useful rules of thumb are: (1) 16 metric tons of food sustain 1,000 people for one month, and (2) to store one metric ton of food, about two cubic meters of space are needed. Proper storage is extremely important to avoid food losses due to rain, pests, or looting.

When calculating the composition of daily rations, the following points should be kept in mind: (1) the ration should be kept as simple as possible; (2) to facilitate storage and distribution, nonperishable food commodities that are not bulky should be chosen; and (3) substitution of items within food groups should be allowed for.

The food ration should be based on three food groups: a staple, preferably a cereal; a concentrated energy source such as a fat; and a concentrated source of protein, such as salted or dried fish or meat. In practice, the diets will be dictated by the availability of ingredients. A standardized ration may be impractical as availability will change daily and according to areas.

Whenever possible, vulnerable groups should receive a food supplement in addition to the basic diet. Among these groups we include children under 5 years old, who are growing very fast and may suffer permanent damage if malnourished, and pregnant and lactating women, who require more nutrients. Breastmilk is the best food for infants under six months of age, and Health Disaster Coordinators should not allow the emergency situation to become an excuse for flooding the country with infant formula.

PROCUREMENT

If the calculated amount of food required exceeds immediate local availability, and if it is anticipated that food will have to be distributed for several months, steps must be taken to obtain food from elsewhere in the country or abroad. A rough estimate of local food transport requirements should also be made for this contingency.

Food for the initial emergency distribution phase should be obtained from national government or wholesaler stocks, or from bilateral or international development agencies (e.g., World Food Program, NGOs).

If large quantities of food are required from abroad, procurement and shipping may require several months. Approaches to suitable agencies should hence be made at the earliest possible date. It is critical that Health Disaster Coordinators advise potential donors of the eating habits and preferences of their populations. Food not eaten is of no nutritional benefit.

The need for special infant foods ("baby foods") immediately after disasters is often exaggerated. Improving maternal nutrition and assisting mothers economically is more cost-effective and safer than airlifting strained baby foods. Since vitamin requirements are of little concern during the acute emergency phase after

sudden-impact natural disasters, multivitamin tablets should not be requested as a separate relief item. The population's specific vitamin and mineral needs will have to be assessed for the long-term.

SURVEILLANCE

If long-term food supply problems seem likely, as in areas with subsistence agriculture and poor communications, the nutritional status of the community should be monitored. This can be accomplished by making regular physical measurements of a suitable sample of the population. Since young children are the most sensitive to nutritional changes, the surveillance system should be based on them, remembering that the most serious malnutrition results from an acute exacerbation of chronic under-nutrition. In emergency situations, weight-for-height will provide the best indicator of acute changes in nutritional status. If height and weight cannot be measured, arm circumference, which is simple and easy to measure, may be used to gauge changes in communities.

As the results of the first needs assessments become available, more accurate information will make it possible to adjust preliminary estimates of the proportion of the population most in need of long-term food distribution. Surveys of need should make sure to cover not only food availability, but also identify areas where problems of labor, tools, marketing, and other variables affecting distribution have arisen. As soon as an area is able to return to normal consumption patterns, distribution should be phased out.

CHAPTER 10.
PLANNING, LAYOUT, AND MANAGEMENT OF TEMPORARY SETTLEMENTS AND CAMPS

Health authorities will not usually be directly responsible for setting up and managing camps and temporary settlements. Since many aspects of camp management affect the health of the occupants, however, the Health Disaster Coordinator should be involved in decision making as early as possible.

PLANNING SETTLEMENTS AND CAMPS

Temporary settlements or more permanent camps arise in a number of ways. After floods, people can be forced to move to higher dry ground. Such settlements often disband spontaneously when flood waters recede, but may become long-standing if a flood seriously damages agricultural or building land.

After earthquakes or destructive winds, some people who have lost their own houses may be unable to find lodging with relatives and friends. When after-shocks occur and a continuing risk is perceived, people often move into open spaces, parks, and fields.

Humanitarian assistance should be provided to people in or close to their homes. Whenever possible, the deliberate creation of camps should be avoided. More problems will generally be created than are solved because camps and temporary settlements present the greatest potential for communicable diseases once the immediate disaster has passed, and often become permanent even when that is not intended.

It might be expected that providing services to a camp would encourage the population to stay and become dependent on relief. Though this may become true after long periods, it is unusual in the short term. People generally prefer to return to their normal lives and surroundings, and when they become dependent on relief it is usually for want of an alternative.

SETTING UP CAMPS AND SETTLEMENTS

There are two objectives in setting up camps and settlements. The first is to ensure a standard of living for the inhabitants as close as possible to that among similar groups in the country outside the camps. Particularly in temporary settlements, voluntary workers and agencies sometimes provide much better services, food, and housing than the occupants had before and will have after the emergency. This

causes friction with the surrounding population, and gives refugees expectations that the national authorities cannot possibly meet. The second objective is to minimize both capital and recurring costs and the degree to which continuing external administration is required in running a camp.

SITE SELECTION

Locations for camps and settlements should be defined in disaster plans. If this has not been done, a suitable location should be chosen as soon as possible, since that will influence all other decisions about layout and provision of services. The site should be well drained, not prone to seasonal flooding, landslides, tidal waves, or sea surges, and located as close as possible to a main road to ease supply problems. If international support is anticipated, a site with reasonable access to an airport or port should be selected. Locating a camp away from existing urban areas makes access easier and can minimize administrative problems, but for long-term resettlement, a site close to an existing community facilitates the provision of transport and employment.

Around urban areas, where the pressure on land is high, camp land may be available precisely because it is unsuited for residential use. The possibility of acquiring land by purchase or from government holdings should be considered.

CAMP LAYOUT

Permanent communities are characterized not only by their buildings and streets but also by their social cohesion. Since people share services and have common needs, mutual obligation systems evolve that regulate behavior in regard to property protection, waste and water disposal, latrine use, and play areas for children. In shantytowns these mechanisms may be inadequate, but in camps they will be lacking entirely. Such lack of social cohesion contributes to the spread of disease (e.g., by failure to use latrines) and makes camp administration more difficult. Adequate and early attention to physical layout will minimize such problems.

Camps should be laid out so that a small cluster of families is grouped around communal services. Access to a set of services (latrines, a water point) should be limited to a fixed group of people, and individual "communities" within the camp should be small enough to encourage the development of social structures. Many administrative tasks such as latrine maintenance and disease surveillance can be partially delegated to these groups instead of being assigned to an employed workforce. The camp can be expanded with no reduction in the quality of services by adding units at the periphery. Areas must be set aside for administration, reception and administration of camp residents, warehouse facilities, supply distribution sites, and recreation areas.

Grid layouts with square or rectangular housing areas intersected by parallel roads, which were widely used in the past, have the advantages that water, drainage, and power systems can be incorporated easily into the camp plan where land is limited, and they can accommodate high density population. This may also be disadvantageous since it is likely to encourage the spread of disease. Grid camps

are relatively unsuitable for family occupation and should be avoided, particularly for long-term use.

CAMP SERVICES

Water Supply

Proximity to safe water sources is one of the most important criteria for site selection. If the camp is close to a public water supply, a connection may be possible and an important problem solved. Other systems and sources such as self-contained pumps or purifiers may be used, but they are more costly and require regular maintenance. In some areas, tube or dug wells may provide cheap drinking water of high quality.

Contamination of water in temporary storage facilities such as collapsible tanks or household containers is common. Adequate water chlorination and daily residual chlorine and bacteriologic monitoring will prevent illness. The UNHCR recommends a minimum of 15 liters of clean water, per person, per day for domestic needs.

Excreta Disposal

Adequate sanitation is an essential component of diarrheal disease prevention. At least one latrine should be provided for every 20 people, and latrines should be sited for easy access from any part of the camp to encourage their use. Ideally there should be one latrine per family.

Health Services

If the camp is well organized and has adequate sanitation, water, and food supply standards, health conditions will be similar to those in the general population. Unless there is clear medical justification, providing a higher standard of care to camp residents than to the general population should be avoided. Health services can be provided by assigning volunteers or government health workers to the camp or enlarging the capacity of the nearest fixed health facility. The focus of the health services should be mainly on prevention of specific communicable diseases and the establishment of a health information system.

CHAPTER 11.
COMMUNICATIONS AND TRANSPORT

Effective management of health relief requires access to and control of adequate transport and communication. Because the health sector's resources are usually insufficient to meet those needs, advance planning is particularly important to ensure that other institutions and sectors provide sufficient support in the event of a disaster. As part of pre-disaster planning, the Health Disaster Coordinator should make arrangements with entities such as the ministries of transport, public works, and communications; the armed forces; nongovernmental organizations; private passenger and freight transport companies; private and state telecommunications companies; and ham radio operator clubs.

Responsibility and coordination for emergency government transport and communications should be centralized in a single office of the National Emergency Committee, which can coordinate their use for defined relief needs. The importance of developing a good working relationship with national telecommunications agencies and/or private sector telecommunications service providers cannot be overemphasized.

TELECOMMUNICATION

Adequate emergency communication facilities are essential for maintaining rapid and reliable contact with health facilities and relief personnel in the field, as well as with governmental, nongovernmental, private, and international agencies involved in the relief effort.

In most countries, the government allots specific radio frequencies and equipment to the military, fire and emergency services, police, ham radio operators, the private sector, and others in accordance with standards established by the International Telecommunication Union (ITU), a United Nations agency.

Telecommunication technologies and services have undergone tremendous growth during the past decade. Voice messaging, cellular and satellite telephone, and teleconferencing are among the options offered by an increasing array of service providers. The administration of telecommunications assets and services also has changed. State control has been ceded to private companies in some countries; in other cases, State and private companies cooperate in managing the system.

Reliable, low-cost service is still not available everywhere in the world, however. The increased recognition of how vital communications services are, both nationally and internationally—which has been fueled by new portable satellite services

and the enormous popularity of the Internet—offers the hope of expanded accessibility of telecommunications. Following is a brief overview of available services and their reliability and usefulness to disaster managers.

Radio Communication

Radio systems offer many advantages in disaster situations. However, while operating costs are low, the costs of installing and maintaining an efficient system can be high. In most countries, fire and emergency medical systems, military, police, and related institutions maintain some type of radio link, although each service will tend to operate its system independently of others. The health sector should ensure its connection to the national system or systems, and take advantage of the technical expertise offered by capable personnel. There is a wide range of available technology and possible uses, which are summarized below.

High Frequency (HF) Single Sideband (SSB) Radio

Disaster managers in the field most frequently use HF radio to communicate over long distances. This communication is point-to-point and permits voice and low-speed data communications between and among fixed installations at field headquarters and regional offices. Mobile HF SSB units can be used in a similar manner (although by definition, "mobile" units are considered to be permanent installations in vehicles), as can transportable units, which are integrated communications packages designed to be deployed at single locations upon short notice.

A significant advantage of HF SSB networks is that hardware costs are minimal (US$ 4,000–US$ 5,000 for the basic components of a voice-and-data system), and use is free. A disadvantage is that, because of its wide use, it is difficult to get allocation of the dedicated HF frequencies required to operate the system. HF transmissions are also subject to propagation effects that occur daily and seasonally.

Effective distance of HF voice communications ranges from 2,000–3,000 km to 10,000 km, which is usually sufficient for communications between field operations and national headquarters. The use of advanced technology (e.g., the Pactor Level 2, Clover, and other data modes) along with the use of enhanced modems permit effective data communications worldwide.

Very High Frequency (VHF) Hand-Held Radio Communication

For short distance communication (within cities and within geographic regions of approximately 100 km) use of VHF hand-held radios is ubiquitous among national authorities, United Nations agencies, and NGOs for communication among staff. As are HF radios used for longer distance, VHF radios are relatively inexpensive to purchase and free to operate. However, the use of VHF equipment is subject to the delivery of a license with a limited number of assigned frequencies, a process requiring a significant amount of negotiation with local telecommunications authorities. In the absence of regular telephone communication, VHF radios provide a basic and vital administrative function. Another important function is security, as it is possible to maintain contact with staff traveling from one part of a city to another.

Amateur Radio Operators

Amateur, or "ham" radio operators have historically been the first to establish and operate communications networks locally for governmental and emergency officials during and immediately following a disaster. Amateur radio facilities can generally be characterized as having a high survival capability. Although amateur radio operators are most likely to be active after disasters that cause power outages and destruction of telephone lines, they frequently support the delivery and relay of pre-disaster and warning information. Amateur radio operators are generally well-motivated, willing, and prepared to work under extreme conditions encountered during acute emergencies, where both solid technical knowledge and the ability to improvise are required. Although most operators belong to organized groups and show a great sense of discipline and responsibility, the accuracy of their reports may vary widely. Direct, close coordination of these groups by emergency telecommunications managers is critical to avoid the danger of transmitting inaccurate, unconfirmed, or unreliable information.

Governments license amateur radio operators in most countries. Some governments severely restrict the use of amateur radio operators. The International Amateur Radio Union (IARU) coordinates the activities of amateur services and actively supports their introduction in those countries where their value has not yet been fully recognized.

Radio Paging Service

Radio paging is increasingly common in most countries. Its coverage can range from local to international and it is of unquestionable value to disaster managers. Access to and reliability of these systems during disasters depends on a variety of factors ranging from the availability of telephone, cellular, and/or satellite lines to interconnect and operate the system, and the availability of independent sources of electrical power, to the quality of the actual paging transmitter.

While the majority of paging systems are one-way and do not guarantee delivery to the recipient, 1½-way (message receipt acknowledgment) and two-way systems are emerging, often with electronic mail links.

In countries where there is sizable GSM (mobile telephone) penetration, traditional paging systems have been supplanted by the SMS (short message service) which is built into GSM protocols.

Although limited resources may not make it possible to routinely use pagers, if paging service is available, it may be advisable to lease the service for essential personnel in disaster situations. It must be kept in mind that most radio paging services rely on terrestrial infrastructure which is vulnerable during disasters. This is the case to a lesser extent with satellite-based paging systems.

Terrestrial Telecommunications

Traditional terrestrial telecommunications services, the most characteristic of which is telephone service provided via telephone wires, have been costly to install, difficult to repair, and vulnerable to disasters, particularly in remote areas of developing countries. If even one telephone pole is incapacitated in a terrestrial

network, all communications past that point are affected until that pole and its connection to the system can be repaired. Thus, although they may play a role in disaster planning and early phases of warning, terrestrial communications cannot be relied on for continuous use during the disaster onset and in the acute phase of disaster response.

Even if the telephone system is not damaged by the disaster event, it is likely to be made unreliable or unusable because of heavy demand by the affected population. Outages due to overloaded circuits can last anywhere from several hours to several weeks. Dial tones, too, can be affected by power outages and overloads and can be a further obstacle to disaster management.

Health sector disaster managers should develop and maintain good relationships with local and national telecommunication service providers and work with them to develop disaster services and emergency protocols based on the infrastructure at hand.[1] National governments should be encouraged to strengthen their terrestrial telecommunications infrastructure and to make it resistant to the type of hazards present in their countries.

Satellite Communications

Fixed Satellite Service

Early satellite communications service and infrastructure were developed first within large urban areas. Then, through rapid advancements in space technology, population centers were connected. Early communication satellites developed in response to the demand for their services.

The phenomenon of television resulted in increased requirements for greater satellite capacity which was, again, dedicated largely to population centers. Because the technology of these early fixed satellite services did not provide for powerful transmitters, large, complex, and expensive earth stations had to be used to receive and send signals from and to the satellites. They were used as regional or national gateways for major telecommunications trunking services and for television distribution. They are still, for the most part, limited to communications within and between capital cites and large urban areas.

Space segment providers and satellite designers soon recognized the need to reduce the size and expense of the ground hardware and launched a new generation of services that relied on more versatile and powerful satellites. Because these new satellites transmitted more powerful signals, the new ground hardware size and power requirements were significantly reduced.

The capital cost for hardware and the recurrent cost of satellite time were also reduced. In practical terms, this meant a move from stationary earth stations to transportable (*not* portable) systems. These changes in service made possible the advent of very small aperture terminals, or VSATs. The applicability of VSAT services could include linking, in a permanent or semi-permanent network, national health sector disaster managers. This is still costly and it must be remembered that, as with terrestrial telecommunications links, fixed satellite service infrastructure is

[1]See Mark Wood, *Disaster Communications Manual*, available in print from The Disaster Relief Communications Foundation or on the Web at http://www.reliefweb.int/library/dc1/dcc1.html.

susceptible to damage or destruction at the onset of the disaster. Unlike its terrestrial counterparts, however, if one link goes down, all others are not affected.

Global Mobile Personal Communications by Satellite (GMPCS)

In the near future there will likely be dozens of low earth orbit (LEO) satellite systems covering the entire world in addition to the existing geosynchronous satellite networks. They will consist of from 1 to as many as 325 satellites per system and will be a part of a new category of service, GMPCS. These systems offer disaster managers the promise of easy-to-use, reliable, and affordable communications, regardless of the nature of a disaster, its location, or the terrain of the affected area.

These systems will have a wide range of capabilities ranging from narrow band (data only) to broad band (allowing video, voice, and data) communications. GMPCS technologies will likely be of such low cost as to be affordable to all sectors and, thus, should be of great interest to health sector managers.

Despite their promise, in the near-term disaster managers should be cautious when deciding what new and emerging technologies to use and invest in. It is advisable to explore a mix of technologies, including, but not limited to, new GMPCS services until such time as their strengths and weaknesses have been proven.

Mobile Satellite Service

Mobile satellite services were first developed for maritime applications and now are broadly used for aeronautical and land-based purposes. Mobile satellite services are less expensive than traditional fixed satellite services. They are easily transportable and are not dependent on the terrestrial telecommunications infrastructure. They are far less vulnerable to natural disasters and, because they can be used reliably to send data or call anywhere in the world, their use in the field has grown rapidly.

Although lower in cost, they are not inexpensive, and are still used almost exclusively by United Nations agencies and larger NGOs. Although some national/domestic systems are available, the most widely used is that developed by INMARSAT, an international consortium. Costs range from US$ 4,000–US$ 35,000 for hardware and US$ 1–US$ 13 per minute for use.

Additional systems at either end of the technology and cost spectrum are rapidly becoming available. These range from Iridium, featuring hand-held telephones that allow for voice calling from anywhere in the world, to Orbcomm, which offers worldwide low data messaging and data collection from fixed sites or hand-held units.

Electronic Mail Services

Communication by electronic mail has undergone explosive growth. Initially, it was possible to communicate within closed networks, but with the opening of the Internet to the civilian world, millions of individuals and institutions can exchange information from almost any point on the planet. Electronic mail requires a computer with a modem, access to telephone or other telecommunications service, an Internet account, and some training.

The Internet is very useful not only in the immediate post-disaster phase, but also in prevention, preparedness, and mitigation aspects of disaster management.

It is inexpensive to use compared to traditional communication systems. The service makes it possible to contribute to and use information on Web sites about disasters; form and participate in discussion groups and "virtual" conferences among institutions worldwide; and send documents and graphics. It allows free exchange of information among interested parties, with a minimum of bureaucratic restrictions.[2]

It should be understood, however, that most Internet Service Providers rely on terrestrial telecommunications infrastructure, making Internet service vulnerable during disasters. This is an issue not only in terms of the Internet's reliability as a communications tool, but also because Internet users have become accustomed to "storing" valuable data on the servers of their Internet Service Providers and the safety of this data may be in jeopardy during disasters.

Teletype

Teletype is a well-known system, but it has been largely superseded by other systems in emergency communications because of high cost and slow transmission speed. It is still used in certain areas, such as in banking, since it offers security in certain types of data transmission. Availability and access are limited, and its use in emergency situations should not be considered.

Donated Radio Communication Equipment

After a major disaster, there may be an outpouring of offers of donations from countries, organizations, and businesses. Supplemental radio equipment is sometimes included in these offers, but often the radio units are delivered well after they are needed. To make sure that the equipment is of use in the disaster, the donor should be informed of certain technical characteristics, such as: transmitting and receiving frequencies; output requirements (wattage); the country's voltage and amperage; number and type of units needed (hand-held, mobile, base stations); type and quantity of antennas; necessary material for installation (coaxial cable, tools); and the need for specialized personnel.

It is important to keep in mind that radio communications are affected by many factors, and therefore are never completely reliable. Geographical features, atmospheric conditions, urban density, electromagnetic radiation from power transmitters, condition and quality of antennas and transmission cables, quality and capacity of equipment, as well as sunspots and solar eruptions, can all have a negative effect on communication quality. All communication systems are dependent at some stage on radio: telephones have microwave links between central exchanges, and links with satellite; the Internet depends on links between satellites and earth stations; radio pagers depend on radio signals between the central exchange and the beeper. Disaster managers need to be aware of potential failures in these systems at the disaster planning stage. They must also have an inventory of equipment available.

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[2]Recommendations made at the Meeting on Health Crises and the Internet, held in Bogotá, Colombia, November 1997, can be viewed on the Internet (http://www.paho.org/english/ped/ped-internet.htm).

Effective communication after disaster does not depend only on the nature and quantity of equipment available. The willingness of authorities to exchange and communicate specific and detailed information to the public, other governmental agencies, and the international community is of primary importance.

TRANSPORTATION

As in the area of communications, the health sector should coordinate with national institutions for logistic support in transportation. It is crucial to identify the entity responsible for coordinating transport in emergency situations. Arrangements should be made during the disaster planning phase with the following: ministry of public works or transport, the armed forces, the police, public and private passenger and freight transport companies, shipping companies, airlines, and NGOs involved in disaster relief.

Frequently, these institutions or agencies provide vehicles in case of disaster, and the requesting institution covers the cost of fuel and the salary of operators. Airlines generally transport humanitarian relief supplies at a reduced cost. As part of disaster planning, the health sector should establish relations with selected entities, and identify necessary financial resources for operations.

Inventory of Resources

As part of pre-disaster planning, an inventory should be made of vehicles in the country or province that can be commandeered for relief purposes, and the institution providing them (e.g., ministry of health, social security, municipal health service, NGO, etc.). The inventory should specify the type of vehicles (with emphasis on collective transport, four-wheel-drive cars or trucks, and refrigerated vehicles); their maintenance and fuel requirements; their ability to transport personnel or cargo; location; and the names and contact numbers of persons responsible for authorizing use. The same inventory should include agreements made with public and private transport companies during the disaster planning phases, and names of contact persons. It is important to note that contracting vehicles locally must be done immediately in the event of a disaster, as competition among agencies for vehicles in good condition will be intense.

Transport Equipment Needs

Initial requirements for transportation usually focus on life-saving operations; transporting essential staff, equipment, and patients; conveying specialized personnel to assess and evaluate health status in the affected zones; delivery of necessary health supplies to treatment centers; removal of bodies and animal carcasses; clearing access routes to hospitals and health centers; and transporting international donor representatives and media personnel to and from the affected area.

The need for ambulances is often exaggerated. In the early life-saving phase, demand is very high and almost any vehicle is used. Multi-purpose vehicles where stretchers can be fitted are now routinely used by many organizations. The trans-

port of potable water and fuel are areas of special importance to continued humanitarian health operations.

Equipment Sources

Figure 11.1 shows possible uses and sources of vehicles and logistical support equipment that may be available for use in the period immediately after a disaster. The uses suggested depend on the actual situation (as with the use of boats in a flood), and potential sources will vary from country to country. It is often more realistic to rely on national and local sources rather than on international sources.

The Health Disaster Coordinator should give forethought to the logistical support required to carry out a relief operation. This includes fuels and lubricants, road-clearing and cargo-handling equipment, trained drivers, and vehicle mechanics. Mechanics are needed to ensure that the vehicles in emergency reserve are kept in operating condition.

FIGURE 11.1. Possible uses and sources of transport equipment available during immediate post-disaster period.

	USES													SOURCES					
Vehicle type	Survey of disaster	Transport health personnel	Evacuation	Supplies to staging area	Supplies to/ within affected area	Removal bodies	Removal/burial animal carcasses	Transport media personnel	Road clearing	Water supplies	Fuel supplies	Supply handling	Epidemiological surveillance	Functional ministries	Military	Local commercial dealers	Private/ commercial ownership	Foreign agencies/ governments	Red Cross other NGO's
Ambulance		✓	✓											✓	✓			✓	✓
Utility 4-wheel drive	✓	✓	✓		✓	✓		✓		✓	✓		✓	✓	✓	✓	✓	✓	✓
Pickup truck		✓	✓		✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓
Van/station wagon		✓	✓		✓	✓		✓					✓	✓	✓	✓	✓		✓
Motorcycles	✓	✓						✓					✓	✓	✓	✓	✓		✓
Medium/heavy trucks				✓	✓		✓			✓	✓			✓	✓	✓	✓		✓
Bicycles		✓						✓					✓	✓		✓	✓		✓
Water tankers				✓	✓					✓				✓	✓		✓		
Boats (river)	✓	✓	✓	✓	✓	✓		✓					✓	✓	✓	✓	✓		✓
Barges (+ tugs)				✓												✓	✓		
Amphibious vehicles		✓	✓		✓	✓		✓							✓				
Helicopter	✓	✓	✓		✓			✓							✓			✓	
STOL aircraft	✓	✓	✓	✓	✓			✓							✓		✓	✓	
Cargo aircraft				✓				✓							✓		✓	✓	
Amphibious aircraft	✓	✓	✓		✓			✓					✓		✓		✓	✓	
Fuel tankers				✓	✓									✓	✓				
Bulldozers							✓		✓					✓	✓	✓	✓		
Auto cranes												✓			✓		✓		
Animal transport					✓	✓	✓	✓					✓			✓	✓		✓

CHAPTER 12.
MANAGING HUMANITARIAN RELIEF SUPPLIES

The type and quantity of humanitarian relief supplies are usually determined by two main factors: (1) the type of disaster, since distinct events have different effects on the population; and (2) the type and quantity of supplies available in national inventories prior to the occurrence of a disaster.

Immediately following a disaster, the most critical health supplies are those needed for treating casualties and preventing the spread of communicable diseases. Following the initial emergency phase, needed supplies will include sanitary engineering equipment, food, shelter, and construction material.

There are always delays in the arrival of assistance from abroad. Immediate needs must be met primarily with locally available resources from the affected country and resources from provinces or departments adjacent to the area of impact. Humanitarian relief supplies that must come from neighboring countries or from abroad should be strictly limited to those items that meet specific needs that cannot be supplied locally.

The first humanitarian assistance shipments will arrive at a country's main entry points (airports, seaports, or land border crossings) within 24 to 72 hours of the event, but unloading, sorting, storage, and distribution of supplies will take much longer. The majority of relief supplies usually arrive after the most urgent health needs have already been met with local means.

The main problem in all but the least economically developed countries is not the acquisition of large quantities of new supplies in the event of a disaster, but rather the taking advantage of locally available resources. Identification, sorting, classification, inventory, storage, transport, and distribution of items, especially of unsolicited donations, pose another major challenge.

BASIC PRINCIPLES

The following basic principles regarding humanitarian relief supplies should be kept in mind:

- Sources for emergency supplies should be identified as part of the disaster preparedness process. Ideally, there should be a national inventory of resources that can be used in the event of a disaster.
- Stockpiling supplies exclusively for disaster situations is not recommended, because of the high costs entailed for developing countries. Such stockpiles require very efficient supply rotation systems that are costly to implement.

- When a disaster occurs, rapid damage assessment must be carried out in order to identify needs and resources.
- If external assistance is necessary, requests should be strictly limited to resources not available in the affected zone.
- Disaster managers must be prepared to receive large quantities of unsolicited donations from other areas of their own country, neighboring nations, and the international community. The quality and usefulness of such donations is often questionable.
- When requesting supplies, the time required for shipment and distribution must be considered, and there must be planning for needs that will remain unmet after supplies arrive.
- No supplies or other forms of relief should be sent without first verifying the need for such assistance. It is essential to assign priorities for each container shipped.

THE LOGISTICAL SUPPLY CHAIN

There are four principal components in managing humanitarian supplies:

- **Acquisition of supplies.** This requires determining what items are necessary, how to acquire them, and how to use them to meet identified needs.
- **Transport.** This entails an accurate assessment of readily available and alternative means of transportation to promptly and safely deliver supplies.
- **Storage.** An organized storage system safeguards supplies until they can be delivered to their final destination. The system also assists in anticipating amounts of supplies in reserve for later needs.
- **Distribution.** The ultimate objective of the logistic supply chain is to deliver assistance to the persons affected by the disaster or to the organizations in charge of their use. Balanced and controlled distribution must be ensured to avoid abuses, waste, or damage to the supplies.

These components are linked and complementary, and require very careful coordination to ensure that there are no interruptions in the logistics chain.

SUPPLY MANAGEMENT

The main objective of a humanitarian assistance management system is to strengthen national capacity so that supplies are effectively managed from the moment donors offer assistance and through their arrival and distribution in the disaster affected area.

As in other aspects of disaster management, managing humanitarian assistance supplies cannot be improvised. A standing committee or permanent official should be designated to:

- Establish national policy regarding donations and receipt of emergency supplies;

- Promote transparency by openly circulating information among agencies; and
- Provide cross-sectoral training in management of humanitarian assistance.

The agencies most involved in this field, in addition to the health sector, include civil protection agencies, customs agencies, Red Cross societies, and other NGOs capable of mobilizing national and international assistance.

Information management and coordination of logistic operations are the responsibilities of a variety of sectors outside of the health sector. The health sector should concentrate on management of medical and public health supplies.

Humanitarian relief supplies that arrive following a major disaster, whether natural or complex in origin, cause serious logistical and administration problems for national and international authorities. This is particularly true when the supplies have not been requested and their value in terms of meeting real needs is questionable.

A supply management system should be oriented to resolve the following issues:

- Space and transport are scarce or are not immediately available;
- Time is short—an emergency demands rapid and effective supply distribution;
- Donors and the news media receive a negative impression if local officials are unable to absorb supplies quickly and effectively and at the same time there are urgent appeals for assistance;
- There is no follow-up on offers made by donors;
- One agency may receive an excess of supplies, while another does not receive any;
- Key health personnel lose precious time sorting through donated medications that are of limited benefit.

Supply Management Systems

Long experience in international relief operations has demonstrated the value of a uniform system of supply management. Many recipient and donor governments and organizations involved in the management of supplies use the SUMA system. This system, created by the Pan American Health Organization, was adopted by the World Health Organization as a standard for the general management of emergency supplies (see Annex II).

The main tasks of a supply management system (such as SUMA) include:

- Sorting and identifying humanitarian assistance supplies;
- Rapidly identifying and establishing priorities for the distribution of supplies urgently needed by the disaster-affected population;
- Maintaining inventory and distribution control in warehouses;
- Entering all incoming supplies in a database (national authorities use reports generated from the database for decision-making);
- Registering consignments that are delivered to consignees;
- Keeping disaster managers informed about items available for distribution;
- Keeping national authorities and donors informed about items received.

Sorting Supplies by Priority

Certain incoming supplies satisfy urgent needs, others will be useful at a later phase of the emergency, and some are not useful at all. Supplies are therefore separated according to their priority levels. Incoming packages should be clearly labelled to show their level of priority; this is a key factor in managing storage, transport, and distribution of items.

Classifying Supplies

Incoming supplies are generally mixed together: one shipment may contain articles ranging from medicines to construction materials. Life-saving supplies compete for attention with less important or unsolicited items.

SUMA employs a classification system for humanitarian assistance supplies based on 10 basic categories, which are further divided into subcategories. These 10 categories are:

Medicines;
Water and environmental health;
Health supplies/Kits;
Food;
Shelter/Electrical/Construction;
Logistics/Administration;
Personal needs/Education;
Human resources;
Agriculture/Livestock; and
Unclassified.

Supply Inventory

Immediately after classifying supplies, information about technical characteristics, potency, presentation, packaging units, total quantity, etc., is entered into a database. This information, consolidated into a single list, allows disaster managers to make decisions regarding distribution. An inventory is only useful if it is kept up-to-date. Reports that accurately reflect the availability of supplies are very valuable in the decision-making process. Mechanisms to ensure the accurate generation of such reports are an essential component of any supply management system.

Distribution and Storage of Supplies

Once items have been sorted, classified, and inventoried at the arrival point, they are either delivered to consignees where their receipt is registered, or they are sent to an existing or temporary storage facility. All information regarding distribution is transferred to the Emergency Operations Center.

Follow-up on Donor Offers

Donor countries or agencies may not make immediate shipments to a disaster site, but depending on their capabilities, will offer to send specific materials or

equipment. These opportunities are frequently lost if a system is not in place to organize corresponding information. The system should have reliable mechanisms to follow-up on the offers, as well as to keep track of donations received.

Use of Local Stocks

Delays in delivery and high costs of air freight, in addition to lengthy customs procedures (despite international agreements on the free movement of humanitarian supplies), are additional factors to be considered before making urgent appeals for assistance.

Expenditures of air freight are generally subtracted from the total amount a donor allocates for a given disaster. This is another reason for directing efforts to improve the availability and access to resources existing in a country before a disaster occurs.

Every country has normal operating stocks of health supplies found in warehouses belonging to the national and municipal health services, pharmaceutical companies, private health services, nongovernmental organizations (e.g., Red Cross societies, Médecins sans Frontières, CARE, WorldVision), or military and police health systems. These supplies, available in and outside of the affected area, are usually sufficient to meet basic immediate needs during the emergency phase. Even when warehouses are damaged, some stock may be salvageable.

Localized shortages arise in the emergency period because of three main factors: (1) sudden disruptions in normal supply channels and in the availability of supplies; (2) difficulties in locating, accessing, sorting, classifying, inventorying, transporting, and distributing supplies in a disaster zone; and (3) the high consumption of items such as x-ray film and developing chemicals, casting plaster, and dressings.

The effective mobilization and use of available supplies requires that the institution responsible for national disaster management maintain an accurate inventory of resources that could be used in the event of a disaster. The inventory should contain information on the location and condition of the stock. It also should include information on standing agreements for expediting the procurement process of supplies and on mechanisms for transferring supplies to sites where they are needed.

Expired Drugs and Perishable Products

Drugs close to or past their stated expiration dates are often donated or offered. Expiration dates are very conservatively set for some drugs, and with suitable storage, the drugs remain safe and potent for much longer. When such drugs are of particular value, health authorities should decide whether reference laboratory testing and recertification should be arranged. There may be a negative public reaction nationally or internationally if this course is pursued.

Whole blood is often donated from abroad, although its medical need is generally limited. International donors of blood should verify that a need exists, that it cannot be met locally, that the blood can be properly handled, and that its safety can be ensured. It is more suitable to request or donate equipment to collect blood, or a suitable supply of blood substitutes.

LIST OF ESSENTIAL DRUGS

In 1977, an expert committee of the World Health Organization concluded that "for the optimal use of limited financial resources, the available drugs must be restricted to those called essential drugs, indicating that they are of utmost importance, and are basic, indispensable, and necessary for the health needs of the population."[1] This approach, recommended for non-emergency situations, is critical for health management in emergencies.

The United Nations Children's Fund (UNICEF), the International Federation of Red Cross and Red Crescent Societies (IFRC), the United Nations High Commissioner for Refugees (UNHCR), WHO, Médecins sans Frontières (MSF), and other nongovernmental and governmental organizations have developed lists of essential drugs for disaster relief. They also have established lists of medicines, or "kits," for specific situations, including mental health, surgery, chronic diseases, tuberculosis, cholera, trauma, etc. The lists are designed to meet the general needs of 10,000 persons in specific conditions assuming that there are no other locally available resources. The WHO "kit" has characteristics that can be applied in most situations, and provides a good model for establishing lists of essential needs.[2] These kits are a good source of information for medicines and supplies needed for displaced populations. Although each list is designed to meet the needs and relief functions of an organization in specific situations, they have characteristics in common, so they serve as good models for most scenarios.

Health authorities in each country should prepare in advance their own list of basic medical supplies to be made available immediately after a disaster through locally available stocks. To gain maximum recognition and credibility, a variety of health-related institutions should be involved in developing the lists, including the ministry of health, social security, public and private health services, medical schools, Red Cross societies, pharmaceutical companies, etc.

REQUESTING INTERNATIONAL ASSISTANCE

To maximize the benefit of scarce international assistance to the disaster-affected country, the following guidelines should be followed:

1. A single government official should be designated for channeling emergency international appeals, since otherwise duplication, confusion, and shortcomings will result. In many countries in the Region of the Americas, the ministries of foreign affairs have designated a focal point for emergency situations who is involved in making international appeals for assistance.
2. Potential donors should be asked to provide large amounts of a few items since this simplifies and expedites procurement and shipping.

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[1] World Health Organization, *The Selection of Essential Drugs; First Report of the WHO Expert Committee* (Geneva, WHO Technical Report Series No. 615; 1977, p. 9). Since 1977 WHO has updated the list of essential drugs every two years. The most recent list is: *Use of Essential Drugs: (Tenth Model List). Seventh Report of the WHO Expert Committee* (Technical Report Series No. 882), Geneva: 1997.

[2] World Health Organization, *The New Emergency Health Kit: Lists of Drugs and Medical Supplies for 10,000 People for Approximately Three Months* (Geneva, WHO/DAP/90.1, 1990).

3. The request should clearly indicate the order of priority, amounts, and formulation (e.g., tablets or syrup). Vague requests for "antidiarrheal drugs," "antibiotics," or "vaccines" must be avoided. The amounts requested should be compatible with the size of the affected population and the anticipated occurrence of trauma and disease. Requests that international donors have considered out of proportion to the magnitude of the disaster have proved counterproductive.
4. Requests should be limited to drugs of proven therapeutic value and reasonable cost. Emergency situations do not justify requests for expensive and sophisticated drugs (especially antibiotics) and equipment which the country could not afford before the disaster.
5. Perishable products and vaccines should not be requested unless refrigeration facilities are available and special handling arrangements can be made at the airport.
6. Supplies will be duplicated if the same list is sent to several donors. Some items may be shipped by a number of suppliers and others not at all. PAHO/WHO can help the country to assess its needs more precisely and inform donors of the most appropriate assistance. The failure to coordinate donations nationally has resulted in time-consuming direct consultations between governments willing to assist, relief agencies, the United Nations Office for the Coordination of Humanitarian Affairs (OCHA), and PAHO/WHO to determine their respective courses of action.

Some donor countries and agencies are reluctant to replace local medical stocks that have been used for emergency purposes and instead want to supply emergency needs directly. This problem is lessened if donors are informed that the depletion of local stocks because of the emergency will restrict rehabilitation of normal medical services. Donors should also realize that their consignments of supplies often cannot be received and distributed in time to be used in treating casualties.