"El documento original contiene páginas en mal estado"

Table 5.

PATTERNS OF TRAUMATIC INJURY IN NATURAL AND MAN-MADE DISASTERS

A. TRAUMATIC INJURIES EXCEED DEATHS

1. Warfare
2. Explosions
3. Wind Storms (Cyclones, Typhoons, and Hurricanes)
4. Fires
5. Famine
6. Tornadoes
7. Communicable Diseases

B. DEATHS EXCEED TRAUMATIC INJURIES

1. Landslides
2. Avalanches
3. Volcanic Eruptions
4. Tsunamis (Seismic Sea Surge)
5. Floods
6. Earthquakes

C. LITTLE OR NO DEATH OR TRAUMATIC INJURY

1. Hail Storms
2. Snow Storms
3. Droughts
4. Locust Swarms

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of communicable disease follow the pattern of more traumatic injuries than deaths.

It is not unusual for landslides and avalanches to result in no survivors. The same excess of deaths takes place in volcanic eruptions, tsunamis, and floods. Earthquakes tend to vary in their pattern more than the other disasters according to local conditions such as the construction of buildings.

The most extreme example of this phenomenon occurred during the sudden eruption of Mt. Pelee (Martinique) in 1902. An estimated population of 40,000 living near its base died immediately. The sole survivor was able to walk six kilometers to receive medical attention (Downey, 1938). More recently, the Vaiont Dam in Italy gave way in the middle of the night without warning (1963). Over nineteen hundred people

were swept away. The only survivors were those whose homes had been above the crest. There were very few physical injuries (Latter, 1969).

By way of contrast, hail storms, snow storms, droughts, and locust swarms do not produce direct traumatic injury. Although snow storms do claim occasional victims, deaths tend to be isolated individuals or small parties.

It is important that relief administrators appreciate these patterns. If they do not, at least three major problems will persist:

a) Physicians and nurses will be sent to a disaster area in numbers far in excess of actual need. This has occurred recently following the Aberfan Landslide (Howe, 1968), the Vaiont Dam disaster (Latter, 1969), and the 1970 Peruvian Earthquake and Landslides (USAID, 1970);

b) Surgical specialists may be sent to the scene when psychiatrists, pediatricians or public health physicians would have been more appropriate; and

c) The physician on the scene, whatever his specialty, may find that the emergency relief supplies are completely inappropriate or contain surgical supplies rather than sufficient amounts of medical agents.

2. <u>What types of injuries do disasters produce</u>?: I have located surprisingly few detailed reports of the traumatic injuries sustained in a major civilian disaster.

There is, compared to mass disasters, a wealth of information about small, discrete man-made disasters such as vehicular collisions, shipwrecks, explosions, and fires (American Medical Association, 1966, 1967). Military and civil defense organizations have also produced a number of guides and manuals on the injuries sustained in conventional and nuclear warfare (US Public Health Service, 1970).

Not surprisingly, the publications I have found on mass civilian injuries following disasters deal with explosions, fires, tornadoes, wind storms, and earthquakes. These are the disasters which commonly produce excess numbers of injuries (Table 5). I located no articles or reports on the six disasters which result in death rather than traumatic injuries.

Let me try to summarize the information we do have about those disasters which generate large numbers of traumatic injuries. Before doing so, it is well to point out that all the citations save one are from either North America or Europe. Different patterns of injury might occur in the tropics. Certainly the local medical personnel and facilities would differ.

a) Burn Injuries: General surgeons and internists;
   (1) Fire: (Aub and Beecher, 1943; Wells, 1945; Pitanguy and Sinder, 1964).
   (2) Explosions: (Blocker and Blocker, 1949).

b) Orthopedic Injuries: In addition to general surgeons and and physicians, there is an increased need for orthopedic

surgeons, neurosurgeons, and X-ray technicians;

(1) Tornadoes: (Churchill, 1953; Hight et al, 1956; Fogelman 1958; Carruthers and Zavela, 1965; Mandelbaum, 1966; Beelman, 1967).

(2) Windstorms: (Peavy, 1970).

(3) Earthquakes: (Maroc Med., 1961; Saidi, 1962; Vojno-sanit. Pregl., 1964; Mills, 1964).

The medical needs overlap, however, and may vary from disaster to disaster. Following an earthquake, for example, electrical wires or open household fires will produce secondary fires. Injuries from fire are particularly common if the structures are made of wood or other flammable material. Exploding gas or fuel oil may also cause burn injuries.

Occasional medical problems arise which surprise inexperienced disaster physicians. If an earthquake occurs in an area where the buildings are made of brick or stone, a considerable number of injured may develop myoglobinuria and renal failure--the crush syndrome of Bywaters (1944). The demand for special electrolyte solutions, biochemical determinations, and internists will also be increased.

3) What administrative problems will the general practitioner or specialist surgeon face following a disaster? I did not find an article by a clinician which analyzed the administrative and logistical problems of the civilian physician following a disaster.

Military writers such as Ziperman (1957) set out the principles and practice of triage and care of mass casualties without appreciating that the civilian physician operates at a considerable disadvantage. I think that the six major differences are:

(a) The physician has probably never been involved in a disaster;

(b) The average clinician has never had any formal training in disaster medicine;

(c) The patients (and the community at large) are probably in a similar situation with regard to experience and training;

(d) Civilian physicians and communities lack the military discipline and support systems to withstand the social shock and disruption following a disaster;

(e) The civilian physician will be operating in a facility which often has not been designed to handle mass casualties;

(f) The civilian hospital will not anticipate the problems of convergence and the high proportion of psychological cases. These phenomena may not be so important in military populations.

The best operational analyses of the civilian doctor and hospital in disaster have been done by a hospital administrator (Curry, 1969) and a sociologist (Quarantelli, 1970b).

These authors point out five major problem areas:

(a) Inadequate disaster planning. In the United States only the 75 percent of hospitals which are accredited have disaster plans. Disaster plans that do exist fail because they are not practiced frequently enough or are poorly conceived. The usual reason why well-conceived, practiced plans fail is that they may be too specific or deviate too far from standard hospital procedures. The result in either case is a confused and inefficient staff.

(b) Triage is not practiced. A common mistake is to allow major and minor cases to swamp the casualty ward early in the post-disaster period. Few hospital-based physicians have the presence of mind to set up triage or first aid centers on the lawn of the hospital let alone in the community.

(c) Failure to appreciate and prevent the convergence phenomenon. The effectiveness of the hospital is invariable reduced by policemen, firemen, relatives, the press, and private citizens who crowd into the treatment area. A single "public relations" man for the hospital may reduce this problem considerably.

(d) Inadequate secondary power source. The majority of American hospitals put out of commission after disasters are not destroyed--they lose their electrical power.

Storms and earthquakes disrupt electrical power lines. If the hospital has its own auxiliary generator, it is often in the cellar--which is flooded.

(e) Improper registration of patients. Ordinary, sophisticated record systems break down in a disaster. Patients may be lost or over-medicated. Proper registration is particularly important when strange physicians are working in the hospital.

b. Emotional Stress

Sociologists have paid more attention to the psychological problems of survivors of disasters than physicians. Wallace (1956) first identified the "disaster shock" syndrome. Very simply, the syndrome has four stages: 1) shock, 2) suggestibility, 3) euphoria, and 4) frustration. Although these stages occur in all disasters, the extent and duration of each depends upon many other factors. The most important of these are: 1) the recent disaster history of the community, 2) the suddeness of the event, 3) the intensity of the impact, and 4) the overall duration of the stressful situation (Beach, 1967).

Drayer (1955), a psychiatrist, has described the behavior of North Americans suffering from a variety of emotional syndromes. The clinical management of these disorders is based upon four basic principles. The four principles are:

1) Decentralization. Emotional casualties should be managed in the field rather than evacuating them or taking them to hospital.
2) Simplicity. The supportive methods used must be simple and brief. Physicians are not needed for most cases.
3) Positive treatment atmosphere. Relief personnel must appreciate the temporary nature of these distress syndromes and the positive response of most patients to non verbal encouragement.
4) Adequate registration of psychological casualties.

How much emotional stress following disasters varies from one cultural group to another is not known. Clifford's (1954) unique opportunity to observe the behavior of Anglo-American and Mexican families during flooding of the Rio Grande indicated that the national groups reacted quite differently. Schneider (1957) has also documented that islanders on Yap perceive and react to typhoons far differently than Americans do to hurricanes.

More recently, Roth (1970) has codified the cross-cultural differences in response to disaster. Roth distinguishes between strong, intermediate or weak family ties, social centralization, and religious influences. These characteristics are then applied in very general terms to various Eastern, Latin, and Western cultures.

The shortage of published information on this subject and the experience I have had in relief operations suggest that

little formal attention is given to treating psychological trauma after a disaster. Following the Peruvian Earthquake of 1970, for example, many of the survivors flocked to field clinics with no visible injuries, but complaints of "susto" or fear. The Western-trained Latin American and expatriot physicians treated the patients symptomatically with whatever sedatives or tranquilizers were available. Blake (1972 - personal communication) made the observation that psychological complaints were uncommon in communities where Catholic priests had blessed the rubble under which missing family members were buried. Afterwards, many of the priests had held requiem masses for the dead.

c. Epidemic Diseases

We have seen that epidemics of communicable diseases are a major natural disaster in their own right (Table 1). Communicable diseases also pose a secondary threat in every other disaster situation. Historically, a wide variety of serious diseases have followed disasters (Keys, 1950; McCance, 1951; Davidson and Passmore, 1966). These diseases and the most effective methods for their control are given in Table 6.

Epidemics of communicable diseases result directly from the social disruption, crowding, and deficient sanitation that follow all major disasters. These diseases are a particular threat if a disaster produces famine. Malnourished patients appear to be more susceptible to many of these disease agents (Scrim-

Table 6.

SERIOUS COMMUNICABLE DISEASES WHICH FOLLOW DISASTERS AND THE MOST EFFECTIVE METHODS OF PREVENTION AND CONTROL

DISEASE	PUBLIC HEALTH MEASURES
A. WATER AND/OR FOOD-BORNE DISEASES	
1. Typhoid and Paratyphoid Fevers 2. Food Poisoning 3. Sewage Poisoning 4. Cholera 5. Schistosomiasis 6. Leptospirosis	a. Adequate disposal of feces and urine. b. Safe water for drinking and washing. c. Sanitary food preparation. d. Fly and pest control. e. Disease surveillance. f. Isolation and treatment of early case (typhoid and paratyphoid fevers, cholera). g. Mass immunization (typhoid fever and cholera).
B. PERSON TO PERSON SPREAD	
Contact Diseases 1. Shigellosis 2. Non-specific diarrheas 3. Streptococcal skin infections 4. Scabies 5. Infectious hepatitis	a. Reduced crowding. b. Adequate washing facilities. c. Public health education. d. Disease surveillance in clinics. e. Treatment of clinical cases f. Immunization (infectious hepatitis)
Respiratory Spread 1. Smallpox 2. Measles 3. Whooping Cough 4. Diphtheria 5. Influenza 6. Tuberculosis	a. Adequate levels of immunization before the disaster. b. Reduced crowding. c. Disease surveillance in clinics and community. d. Isolation of index cases (especially smallpox) e. Immunization of entire population (smallpox) or children (measles). f. Continue primary immunization of infants (diphtheria, whooping cough, tetanus).
C. VECTOR-BORNE DISEASES	
1. Louse-borne typhus 2. Plague (rat flea) 3. Relapsing fever 4. Malaria (mosquito) 5. Viral encephalitis	a. Disinfection (except malaria and encephalitis). b. Vector control c. Disease surveillance d. Isolation and treatment (no isolation for malaria)

shaw et al, 1968). The best way of attacking communicable diseases after a disaster is to improve the adverse environmental conditions as rapidly as possible so that they do not occur. If the disease does break out, one must have an accurate disease surveillance system to pick up the early cases before the epidemic gets out of control.

In the past, epidemics of communicable disease often caused more deaths than the primary disaster--usually war or famine (Zinsser, 1935; Keys, 1950; Woodham-Smith, 1962; Foege, 1971). Present evidence suggests that improvements in environmental sanitation, disease surveillance, and preventive medicine have drastically changed this situation. The present status of epidemics following disasters can be discussed best by dividing the world into the rich and poor countries.

1. The risk of epidemics after a disaster in the rich countries is minimal. Thirty years ago, six years of war and occupation had little effect upon communicable diseases in the general population. At the end of World War II, the new cases of pulmonary tuberculosis had risen steadily in Western Europe and the total number of typhoid fever cases had doubled (Burger et al, 1946; Lindberg, 1946). The same observations were made in Greece (Valaoras, 1946).

The situation in concentration camps (Markowski, 1945; Leyton, 1946) and Eastern Europe was more serious. Mass population movements, crowding, and poor sanitary conditions resulted

in sporadic outbreaks of dysentery (type unspecified), scarlet fever (streptococcal disease), diphtheria, and typhus (Brozek et al, 1946). Many of these outbreaks occurred in marginally malnourished or starving populations.

I have not been able to locate a single medical report of a documented outbreak of a serious communicable disease following a disaster since 1945 in either Europe or North America. The previous citations in this dissertation either state categorically that there were no epidemics or do not mention the subject. Since vital statistics have improved and natural disasters continue to occur in Europe, failure to report cases is not a satisfactory explanation.

Indeed, one would have predicted that Europe and North America would be at risk from only a minority of the diseases liste in Table 6. These diseases are: a) food poisoning, b) sewage poisoning, c) non-specific diarrheas, and to a lesser extent d) infectious hepatitis, e) shigellosis, and f) influenza. The risk from the other diseases on the list has been minimized or eliminated by a general rise in sanitary conditions and four specific factors. These factors and the diseases most affected are:

a) Disappearance of the disease from the population: smallpox, louse-borne typhus, plague, relapsing fever, and malaria. Imported cases of smallpox or malaria and sporadic cases of plague from an animal reservoir are detecte almost immediately through epidemic disease surveillance.

b) High level of vaccine-induced immunity: measles, whooping cough, diphtheria, and tetanus. BCG vaccine has been used extensively in Europe to provide some protection against tuberculosis.

c) Disease aborted or cured by anti-microbial agents: typhoid carriers, streptococcal disease, and tuberculosis.

d) Great reduction of the prevalence of disease: typhoid fever, scabies, whooping cough, diphtheria, and tuberculosis.

Of the six diseases to which developed communities are subject following disaster (food and sewage poisoning, non-specific diarrhea, infectious hepatitis, shigellosis, and influenza), only influenza can be prevented by immunization. Gamma globulin only reduces the clinical severity of infectious hepatitis (Cruickshank et al, 1968). Neither immunizing agent should be recommended for mass immunization following disaster. Vaccination with potent, antigen-specific influenza vaccine is restricted to the elderly, patients with chronic debilitating disease, and essential personnel before disease appears in the community. Gamma globulin is limited to close contacts of patients with infectious (type A) hepatitis.

Widespread vaccination against typhoid, paratyphoid, and tetanus after disasters (LRCS, 1970a) should be re-evaluated in view of this record. I do not think these practices should be recommended in developed countries in the absence of a well-documented epidemic of the disease. There are two technical

considerations which restrict the usefulness of these agents.

a) Primary immunization requires at least two and possibly three injections at intervals of several weeks. Severe tenderness is a frequent complication of typhoid and paratyphoid vaccinations. Populations may refuse the second injection. This time sequence limits the effective use of these agents to special long-term situations such as camped refugees.

b) Typhoid and paratyphoid vaccines confer only partial protection which lasts only several months. Controlled field trials have shown that typhoid vaccine given in a full series confered no more than about seventy-five percent protection (Ashcroft et al, 1964; Yugoslav Typhoid Commission, 1957). Protection drops rapidly after six months.

Finally, I have been able to find very little information about how (or whether) typhoid and tetanus vaccines are distributed after disasters. The Office of Emergency Preparedness (1969), for example, has a policy of sending 200,000 doses of typhoid vaccine to flooded areas in the United States. Who gets immunized? Is the vaccine actually given? These are questions which should be looked at before the value of these immunizing agents is judged.

2. We know very little about the risk of epidemics following disasters in the poor areas of the world. The status of communicable diseases and disease reporting is quite different

in the poorer countries. There are five important areas in which the rich and poor countries differ with respect to communicable diseases and disasters:

a) Paucity of base line surveillance data: Disease reporting is so incomplete in most poor countries that it is difficult to know after a disaster if there is an epidemic. Let us say that there have been no reported cases of cholera from a thana in Bangladesh for several years. If a mobile medical teams holds a clinic in this area and diagnoses ten cases of cholera, is this an epidemic of cholera or has the presence of endemic cholera finally been recognized? All too often the press and some relief agencies confuse improved reporting with increased levels of disease.

b) Persistance of most serious communicable diseases: The majority of developing countries present patterns of communicable disease similar to Europe and North America at the turn of this century. Gastro-intestinal disorders, typhoid fever, streptococcal infections, measles, whooping cough, diphtheria, and tuberculosis are common in most communities.

c) Circumscription of some serious communicable diseases: Many of the vector-borne diseases associated with disasters (louse-borne typhus, plague, relapsing fever, and malaria) have been restricted by improved hygiene and vec-

tor control programs to certain areas in the world. Despite the current pandemic of cholera and the introduction of smallpox into Yugoslavia and the Middle East, these diseases are also limited in their distribution (Center for Disease Control, 1972).

d) High level of natural immunity: At the time a disaster strikes, the population of a poor country will have little or no vaccine-induced immunity. Exceptions may be seen with smallpox (and measles in West Africa). The survivors, however, are likely to have had previous exposure and some degree of natural immunity to typhoid, measles, schistosomiasis, hepatitis, and malaria. The chances of natural immunity increase with the endemicity of the disease and the age of the population. Malaria may be severe if it reappears in an area from which it had been eradicated; young African children will suffer severely from measles.

e) Inadequate medical and diagnostic facilities: In normal times medical and laboratory facilities may be inadequate for the diagnosis of epidemic diseases such as yellow fever, smallpox, typhus, and viral encephalitis with any assurance. Conditions will be worse after a disaster. Suspect smallpox, cholera, and typhoid cases will be reported on clinical grounds alone by physicians with varying experience with these diseases. Even familiar dis-

eases may be misdiagnosed. During the Nigerian Civil War, for example, many physicians were convinced that there had been a tremendous increase in tuberculosis in the population (Miller, 1970). Tuberculin skin testing in the field, however, showed that the conversion rate in children was the same as before the war (Comstock, G., 1970 - personal communication).

Despite our ignorance of levels of disease before a disaster and problems with accurate diagnosis, few epidemics have been documented recently after disasters in the tropics. I have found specific statements that disasters were not recognized following the Bihar Famine of 1966-1967 (Ramalingaswami et al, 1971), the Nigerian Civil War (Foege, 1971), the Peruvian Earthquake (USAID, 1970), and the Bay of Bengal Cyclone of 1970 (Sommer and Mosley, 1972). Most official reports do not mention the subject--except perhaps to refer to rumored outbreaks.

Epidemics do represent a clear threat to disaster-prone poor countries. At present, Bangladesh is an example of how war, mass population movements, lapse of government services, and poor nutrition have resulted in the reintroduction of smallpox (World Health Organization, 1972). True epidemics of cholera may or may not be occurring.

Mass immunization campaigns against these diseases may not be the best method of control. I make this statement for five reasons. They are:

a) Mass vaccination campaigns often are not necessary. Surveys in Nigeria (Foege, 1971), Peru (Blake, 1970), and Bangladesh (Sommer and Mosley, 1972) have investigated rumored reports of diseases and found no increase in incidence during a disaster.

b) The campaigns are a drain of valuable manpower and resources. This is self-defeating if the improvement in environmental and sanitary conditions is neglected to transport immunization teams.

c) The logistics of a mass campaign are often impossible after a disaster. An effective mass campaign requires extensive planning, good communications and transport, and full access to the population at risk. All these elements are absent from disasters. How much of the hundreds of thousands of doses of vaccine sent to the tropics after disaster actually finds its way into some one's arm?

d) The mass campaign in a post-disaster situation may miss the population groups most at risk.

e) Non-viral vaccines (typhoid, cholera, tetanus, and BCG) require two or more widely spaced injections (except for BCG) or have low, short-lived protection for the vaccinee (typhoid and cholera vaccines).

I believe more attention should be paid to improving disease surveillance following disasters. This epidemiologic ap-

has three main advantages:

a) Disease surveillance provides base-line data. When an epidemic does develop it is more likely to be recognized.

b) Disease surveillance is less expensive. Relatively small amounts of vaccine on-the-spot can be used to vaccinate around the index cases and confine the outbreak.

c) Epidemiologic surveillance and control is feasible in disaster situations. During the Nigerian Civil War, epidemic measles on the Federal side was rapidly controlled using disease surveillance. The guide lines for this approach in disaster situations have been summarized by Foege (1971).

d. Indigenous Diseases

When medical services have been disorganized by a disaster, life and disease processes go on. Pregnant women will deliver and expect to do so under the supervision of a doctor or midwife in reasonably clean surroundings. Natural deaths will take place in the elderly and chronically ill. Diabetics and other patients with chronic diseases must be maintained on insulin and various therapeutic agents. Medical supply officers have the responsibility to take these factors into consideration following disasters.

A disaster often does considerable damage to disease control programs in the poorer countries. The Nigerian Civil War, for example, completely disrupted the leprosy treatment program.

The war also delayed the mass smallpox/measles immunization campaign in the war-affected areas for almost two years. Relief agencies should make a point of assisting the local health authorities to maintain these programs rather than setting up autonomous, temporary clinical facilities.

Let me raise one final moral problem. Medical services in the developed countries are disorganized for a short period after disasters. Rural areas in developing countries often have no regular clinical services. After a disaster in the Peruvian highlands, trained medical specialists suddenly appear. For a short period of time, the quality of medical care is higher than the Indians have ever experienced or the central government will be able to provide in the forseeable future. The specialists begin to treat the indigenous medical problems--and then they disappear. How fair is this emergency attack upon chronic health problems to the community and the host government?

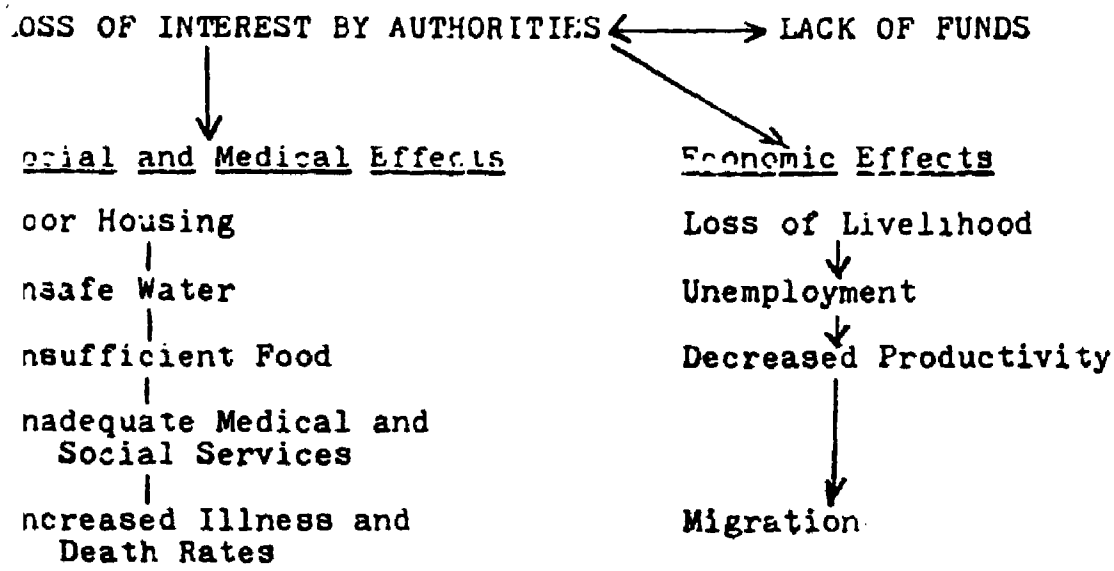
4. Long-Term Elements of Disasters

The long-term effects of disasters may not develop for several years. At the moment the press, the public, and relief agencies lose interest in a disaster-stricken area after an interval. The primary cause is often a more recent disaster. Invariably, however, private and governmental assistance agencies are more concerned with emergency relief than long-term rehabilitation. This neglect of the long-term effects of dis-

aster upon the community may lead to inadequate planning and funding for full rehabilitation. Developing countries with limited capital are particularly vulnerable unless they receive intelligent outside assistance. The long-term disruptive effects of disasters are outlined in Figure 3.

Figure 3.

E POTENTIAL LONG-TERM EFFECTS OF DISASTERS UPON COMMUNITIES



Studies on the long-term effects of disaster upon a community are practically non-existent. Haas (1969) has returned to he scene of the 1968 Sicilian Earthquake in 1971. Anderson 1969c) studied the effects the Anchorage Earthquake of 1964 ad on local organizations 18 months after the disaster. Anerson found that 17 of the 23 organizations he studied had unergone severe changes. This is an area which requires coniderably more attention.