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IMPORTANCE OF PREPARATORY MEASURES IN DISASTER EVACUATIONS*

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I INTRODUCTION

Background

Evacuation of people from an area of danger is a basic protective action both in war and in peacetime disaster. Hardly a week goes by in the United States without some sort of evacuation being performed to avoid possible injuries and death. Many of these evacuations involve only a few people from a few families. They tend to occur "naturally" in response to observation of a threat or instructions from police or other officials. Periodically, however, large numbers of people are evacuated. In these cases, it would seem to be important that preparatory measures of some sort should be made if the evacuation is to be successful in saving lives.

Interest in preparations for evacuation is more-or-less routine in areas subject to certain natural hazards, such as hurricanes and floods. It is more sporadic in other areas although transportation accidents, explosions, and fires can call for evacuation of large numbers of people. The extent to which it is prudent to engage in preparations for such contingencies may be subject to question. One basis for judgement that might be useful is an understanding of the degree to which various preparatory measures have influenced the conduct of the disaster evacuations that have already occurred.

The preparatory measures that can be readily identified as potentially useful are:

(1) Preparing a plan of action.
(2) Acquiring any specialized equipment and communications.
(3) Training and orienting emergency personnel and decision-makers in the actions to be taken.
(4) Informing and instructing the population who may be evacuated in event of need.

One can argue that all of these preparatory measures, and possibly others, are necessary in

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principle. The questions addressed in this paper are to what extent they were taken in advance of past disaster evacuations and what was the effect, if any, of the presence or absence of one or more of the above measures. To address these questions, it was proposed to review the results and conclusions of other scholarly disaster studies and to evaluate directly disaster records in the files of the Federal agencies concerned with emergency operations.* After action reports, analyses and other disaster-related information in the files of the Defence Civil Preparedness Agency, the Federal Disaster Assistance Administration and other agencies were summarized, this data was analyzed with respect to the existence of emergency plans, pre-disaster public information activities, and tests involving either disaster organizations, the public, or both, and their effect on the carrying out of such plans.

Limitations of the Analysis

Every analysis is limited to some degree by the amount of information available and this present study is no exception. The record identifies many more evacuations than it contains data on. And, in many cases, the data is limited to place, date, number of evacuees, and cause. This makes it difficult to perform a rigorous quantitative analysis of the effect of a particular characteristic on the effectiveness of an evacuation. But a number of analyses are available in which trained observers have examined various aspects of the disaster, especially needs that they have seen for better preparation. And finally, the record gives mute testimony to the actions of government officials and agencies and to the results.

Taken all together these bodies of information were found sufficient to draw conclusions as to what is important and what is not important in preparing for emergency operations including evacuation. And while it was not possible to assess the relative value of all alternative preparedness measures related to effectiveness, it was found possible to identify the kinds of data that should be recorded to permit such an assessment in the future.

*The authors acknowledge that the application of their findings to other countries remains an open question.

II DISASTER EVACUATION EXPERIENCE

General

Historically, evacuation has long been adopted as a protective measure against known or perceived hazards – an approaching enemy army or a rising river. Before 1960, most evacuations were of this kind, e.g., Boston in 1775 and Topeka, Lawrence, and Kansas City in 1951. With the development of means for identifying approaching hazards – enemy bombers, hurricanes, etc. – in the 1950's, evacuation came to be seen as an effective defence against a wider spectrum of hazards. Several evacuation tests by civil defense in 1954 and 1955 showed that planned, orderly evacuations could be successful. When Hurricane Audrey struck Cameron Parish in Louisiana in 1957 with great loss of life, impetus was given to evacuation planning and its wider adoption as a defensive measure. As the years have passed, the incidence of evacuation has increased; how much it has increased is difficult to say.

Evacuation Data

In planning this study, it was decided that a rigorous analysis would require the data listed on the Evacuation Study Work Sheet (Fig. 1) and that only those evacuations in which 100 or more people moved would be studied. Data was obtained chiefly from a search of the files of the DCPA Disaster Research Center and from Hans and Sell [11]. Information on major events was obtained from studies by the Defence Civil Preparedness Agency (DCPA), the Office of Emergency Preparedness (OEP), the Disaster Research Group of the National

Incident _____

Place _____

Year _____

I. Incident.

1. Nature: Natural _____ Accident _____ Exercise _____
2. Description: _____
3. Build-up: Instant _____ Hours _____ Days _____
4. Prior Warning: Of Possibility: No _____ Yes _____ When _____ How _____
   Of Approach: No _____ Yes _____ When _____ How _____
   Of Event: No _____ Yes _____ When _____ How _____
5. Time of Event: Date _____ Hour _____

II. The Evacuation.

1. Area Evacuated: _____
2. Reception Area: _____
3. Number of Evacuees: _____ Total Population _____
4. Time of Evacuation: Start: Day _____ Hour _____ ; Finish: Day _____ Hour _____
5. Evacuation Order: By _____ In Name of _____
6. Spontaneous: No _____ Yes _____ Triggered By _____
7. Movement Control: No _____ Yes _____ By _____

III. The Preparation.

1. Plan: No _____ Yes _____ By _____ Date _____
2. Publicized: No _____ Yes _____ By _____ How _____
3. Exercise: Government: No _____ Yes _____ Date _____
   Public: No _____ Yes _____ Date _____
4. Previous Evacuations: No _____ Yes _____ Dates _____

IV. Results: _____

1. Deaths: No _____ Yes _____ Number _____
2. Injured: No _____ Yes _____ Number _____
3. After-Incident Report: No _____ Yes _____ Findings _____

Recommendations _____

V. Documentation: _____

Fig. 1. Evacuation study work sheet.

Academy of Sciences/National Research Council (NAS/NRC), and the Ohio State University Disaster Research Center. Availability of data was discussed with the American National Red Cross, the Bureau of Motor Carrier Safety, and the Federal Railroad Administration. These three organizations advised that their records would not yield the kinds of data being sought.

In all, reports of 228 evacuations of 100 or more people were found. These events are listed in Appendix A in five classes by type of event that posed the hazard. Accidents include events involving the release of – or threat of release of – toxic and corrosive chemicals and explosions – and the threat of explosions. Fires include forest and wild land fires and conflagrations in urban and suburban areas. Flash floods are those in which the warning is measured in a few hours as in the occurrence of torrential rains or the collapse or impending rupture of a dam or reservoir. Floods are those in which the warning is measured in days as when a river crest moves downstream. Hurricanes are tropical storms that produce exceptionally high tides or tidal waves and often produce heavy rainfall. For simplicity, this class also includes – for this study – the two cases of tsunami for which evacuation data was found.

Accidents and fires as well as flash floods tend to have a rapid build up; i.e., only a few hours pass between the first perception of the threat and the onset of the hazard. In these terms, floods and hurricanes have a long build up. And it is worthy of note that there is a rough correlation between length of build up and area involved: the longer the build up, the greater the area.

In only 56 of the cases listed in Appendix A were data found other than place, date, cause, and number of evacuees. Substantial amounts of data were found only in the few instances in which post-disaster studies had been made. The extent of the data, by type of event, is shown in Table I.

TABLE I

Data on Evacuations

Type of Event	Number of Evacuations	Reports with more than Basic Data	Reports Mentioning Plan
Accident	75	12	8
Fire	10	0	0
Flash Flood	22	7	3
Flood	92	15	13
Hurricane	29	22	21

The total numbers of the people evacuated for the evacuations listed in Appendix A are shown in Table II.

TABLE II

Number of Evacuees

Type of Event	Number of Evacuations	Total Number of Evacuees
Accident	75	298,120
Fire	10	11,500
Flash Flood	22	148,380
Flood	92	296,170
Hurricane	29	1,166,310
	228	1,920,480

It should be noted that hurricane evacuations account for the majority of evacuees and that the average hurricane evacuation has involved about 40,000 evacuees as compared with about 4,000 in other types of disasters.

The increase in number of pre-disaster evacuations over the years can be judged roughly from Table III.

The increases shown may exaggerate the real situation because record-keeping has gradually improved and because records of recent years are more readily available. For example, DCPA after-action documents for years before 1973 had been retired to a government document center and were not available for study.

All of these numbers would have been larger if sufficient data had been available. Hans and Sell listed 338 evacuations in 8 states for

TABLE III

Pre-Disaster Evacuations

Period	Accident	Fire	Flash Flood	Flood	Hurricane	Total
Before 1960				5	1	6
1960–1969	30		2	20	21	73
1970–1975	45	10	20	67	7	149
	75	10	22	92	29	228

which the number of evacuees was not found. In the search of the DCPA files, many reports of evacuation were found that did not give number of evacuees. Not all of these would have met the 100-minimum criterion set for this study. But if the data for them had been available, the numbers of evacuations in the above table would have been larger, especially for the periods after 1960.

Evacuation Tests

Tactical evacuation of the central cities was introduced into civil defense planning in the early 1950's as an optional measure for defense against enemy attack. In those days, warning of 4 hours or so of the onset of an attack was expected. Previous evacuation experience was for the most part related to events with a long build-up time, e.g., several days in the case of a flood on a sizeable river. But there were few data on the factors affecting the planning for tactical evacuation.

In 1954 and 1955, about ten cities conducted tests of evacuation plans to obtain data, primarily on traffic flow, organization, and control. Those identified are listed in Appendix B. The tests varied in size from 8,000 evacuees out of 28,000 people in Bremerton, Wa., to 101,000 evacuees out of 372,000 people in Portland, Or. They included a test in Mobile, Al., in which 37,300 out of 38,000 school children were evacuated. Then in 1957, 1,500 volunteers were evacuated from Binghamton, NY to Deposit, NY to test methods for reception and care of evacuees. This evacuation also tested a proposed method of traffic control, which was found unnecessary. In no case were these tests designed to publicize adopted evacuation plans or to train the public.

III EFFECT OF PREPARATORY MEASURES

General

Sources of information bearing on the need for or usefulness of preparations for the evacuation of threatened population groups are of several kinds. First, there is the body of data concerning actual disaster evacuations summarized in Appendix A. Second, there are the perceived needs voiced by officials involved in disaster evacuations as a result of their experiences. Third, there are the observations and conclusions of trained observers who have published analyses of various aspects of disasters. Finally, there is the mute evidence of behavior on the part of public officials and agencies of government. All of these have been consulted in this study.

Some 228 instances of disaster evacuations in which it is known that at least 100 persons were evacuees are tabulated in Appendix A. Other instances have doubtless occurred but records of these evacuations, if they exist, are not readily available. Of the 228 tabulated incidents, only in 56 or 25 percent was the presence or absence of preparatory measures mentioned in the documentation reviewed. This does not mean that preparatory measures

played no role in the 75 percent for which the record is silent. As will be discussed, disaster preparations are more pervasive than some might imagine and are likely to have exerted some influence even though not remarked upon.

In attempting to evaluate the effect of preparatory measures on disaster evacuations, we will follow the organization suggested in the Introduction although it will be found that, in many respects, it is not possible to discuss each measure separately from the others.

Emergency Plans

All of the 56 tabulated incidents in which reference to preparatory measures was found contain references to the existence or lack of specific evacuation plans. In 80 percent of the cases (45 instances), existence of an evacuation plan was mentioned. In 20 percent (11 instances), lack of prior planning was mentioned. Most of the plans mentioned were in connection with flood and hurricane evacuations, as can be seen in Table IV.

TABLE IV

Summary of Disaster Evacuation Data

Disaster Type	Number of Cases	Mention Measures	Had Plan
Accidents	75	12	8
Large Fires	10	0	0
Flash Flood	22	7	3
Flood	92	15	13
Hurricane	29	22	21

Floods and hurricanes are repetitive seasonal threats in many areas. One kind of evidence for the perceived utility of specific evacuation plans is that few communities facing this sort of threat are without such plans, at least in recent years. Of course, hurricane evacuations are usually major operations. Of the approximately two million evacuees accounted for in the incidents tabulated, a majority were caused to evacuate because of the threat of hurricane tides. About ten times as many people are involved in the average hurricane evacuation as are involved in other types of disaster evacuations. Thus, the need for prior planning is most evident for this disaster type.

In the accident and flash flood incidents, 11 of 19 cases in which preparatory measures are discussed were said to be based on an evacuation plan. Several of these plans, however, were devised after the threat to the population was imminent. The chlorine barge incidents at Baton Rouge [7] and Morgan City, Louisiana, [6] and at Louisville, Kentucky [9], are examples. How many other slowly-developing threats motivated the preparation of evacuation plans is not known. There are several instances of plans being prepared in response to a specific threat where an evacuation was not needed. Operation Red Hat, in which military nerve gas was moved by rail in the Pacific Northwest, was a case in which fairly elaborate evacuation plans were laid but never implemented. Although not treated here, these incidents also demonstrate an official recognition that evacuation plans are useful.

With respect to the data summarized in Table IV, however, it does not seem possible to attribute any quantitative improvement in the disaster outcome to the existence of prior evacuation plans. In general, disaster evacuations have been remarkably effective whether they are based on specific evacuation plans or not. For example, 5,700 out of 6,000 residents of Cameron Parish, Louisiana, were evacuated in 1961 on the basis of a written parish evacuation plan brought about by the Hurricane Audrey disaster of 1957 [27]. In 1971, 80,000 out of 81,000 people in Los Angeles threatened by the impending collapse of the Van Norman Dam were evacuated in a period of six hours without benefit of an evacuation plan [30]. Where needless loss of life has occurred, it seems to be attributable to factors other than lack of an evacuation plan, as discussed at a later point.

Despite the failure of the limited data to exhibit a quantitative effect that can be attributed to the existence of evacuation plans, there is a relative abundance of other evidence. Incidents in which preparatory measures are mentioned always discuss the evacuation plan. Moore et al. [16], in a study of the response to Hurricane Carla, concluded, "Civil defense planning was shown to have had high value in meeting the emergency and in keeping the number of casualties at a minimum". Where a plan existed at the time of the evacuation, its value was extolled. For example, the mayor of Lansing, Michigan, is reported as stating during the April 1975 flood, "Years of planning and exercises are paying off". Where no plan existed, preparation of an evacuation plan was proposed as part of the lessons learned. An official review of the Louisville, Kentucky barge incident, for instance, argued that it demonstrated the need for pre-disaster planning. Proposals for improvement are also common in after-action documents; e.g., the after-action report on the 1972 flood evacuation of Wilkes-Barre, Pennsylvania, cites the need for a better, more detailed plan.

One possible explanation for the fact that instances of major evacuation can be found that were successful without the aid of a plan is that few local jurisdictions are without an emergency plan of some sort even though a specific evacuation plan may not exist. This situation is largely the result of a civil defense requirement that must be met by State and local governments to qualify for Federal support in the form of matching funds for staff and equipment and access to surplus property of considerable use to the community. The required plans focus on response to enemy attack but have much in common with responses to peacetime disasters. A field study by System Development Corporation for the Defence Civil Preparedness Agency in 1970 [25] disclosed that while many such plans were pro forma or compliance documents of a too-general character, many others were rated highly. A relatively recent requirement is that these plans must be updated at least every two years, which is intended to correct these kinds of deficiency. Additionally, the Defence Civil Preparedness Agency, within interagency agreements, has broadened its emergency preparedness program to include readiness for all the types of emergencies that are identified in a risk analysis for a locality and has had in operation for a number of years a program of on-site planning assistance to local governments that has tended to emphasize peacetime incidents rather than nuclear war. The Van Norman Dam incident is a clear example of the influence of such emergency planning. It is quite true that a specific evacuation plan for the affected area was not available but a well-developed emergency organization exists in the Los Angeles basin and that could well explain the evacuation success.

It is significant to note that after-action documents on the Van Norman Dam incident stress that the county emergency plan was not sufficiently explicit for this type of incident, that provision should be made for better exclusion control, and that there should be written "Red Cross plans", presumably for reception and care of evacuees [30]. This is characteristic of the support given to the need for evacuation plans.

EQUIPMENT AND INFRASTRUCTURE

The second kind of preparedness measure that should be considered has to do with the facilities, equipment, and supplies that are needed to make an evacuation plan work. For the most part, disaster operations rely on resources normally available to the community and evacuation of people is no exception. Private automobiles or travel by foot are used for most of the actual evacuation, with school buses and other suitable vehicles provided for those in need of transportation. Public safety vehicles and communications are also relied upon. Commercial radio and TV stations are

relied upon to broadcast messages to the affected public. In most cases, however, some specialized facilities, equipment, and supplies are found to be needed in order for an evacuation plan to work efficiently. The nature of these specialized needs tends to vary with the type of threat.

An important distinction among various disaster types is the amount of buildup or advance warning intrinsic in the event. Floods and hurricanes are not only seasonal in occurrence but also are slowly-developing threats on which advance information is obtained through the use of weather forecasts, aerial surveillance, upstream flood stage measurements, and the like. Thus, the public can be alerted to the potential danger well in advance and given instructions relative to evacuation behavior. In a flash flood situation, such as the Rapid City, South Dakota, disaster, the evacuation process involves little warning and great urgency. In the evacuation incidents that we have tabulated, the fires, floods, and hurricanes are generally slowly-developing events whereas the accidents and flash floods are of the rapidly-developing kind.

In slowly-developing events, specialized means of providing warning have not usually been found to be needed since weather warnings and flood measurements are now well developed. The Marysville-Yuba City flood of 1955 is an exception where the need for better upstream measurements was noted in the after-action documents. Rather, the need for coordination of evacuation and other disaster activities from a centralized emergency operations center has been noted since the Midwest floods of 1951. In the data screened during this study there are four cases in which the need for better Emergency Operating Center (EOC) facilities was stressed in after-action documents. An equal number of comments on the inadequacy of communications can also be found. This relatively low incidence of expressions of need is probably the result, in our opinion, of the long-standing emphasis in civil defense programs on the development of an adequate emergency operations center in every political jurisdiction. These EOC's and the communication systems they tie together are routinely of value in a wide variety of peacetime emergencies.

In a rapidly-developing kind of disaster threat, maximum forewarning of existence of the threat and effective means of alerting and advising the affected population are the specialized capabilities of general note. These are found especially in the documentation of flash flood disasters such as in Buffalo Creek, West Virginia, and Rapid City, South Dakota [12]. As a consequence, the National Oceanic and Atmospheric Administration is presently engaged in developing a nationwide flash flood warning network. Having knowledge of the threat, civil defense sirens, public safety vehicle sirens, loud speakers, and door-to-door visits have been used for alerting the population. Broadcast media and door-to-door visits are the main means of instructing the public to evacuate. In the past, these methods have been successful.

Finally, for some threats, such as radiological accidents and transportation accidents and explosions involving the release of hazardous chemicals, specialized instruments and training must be included in the requirements for specialized facilities, equipment, and supplies. These may be needed not only to provide a basis for ordering evacuation but also to define the area at risk and to indicate when the need for evacuation has ended.

While this discussion has emphasized lessons from disaster evacuation experience, it should be understood that careful preparation of an evacuation plan can serve to identify specialized needs and ways to meet them. This is perhaps another reason for asserting the utility of evacuation planning.

TRAINING AND EXERCISING

The third kind of preparatory measure identified in the Introduction is the training and

orienting of emergency personnel and decision-makers in the actions to be taken in the event that an evacuation becomes necessary. In the data tabulated in Appendix A, specific mention of training and orientation is generally confined to the mention of prior exercises, as shown in Table V.

TABLE V

Exercises Related to Disaster Experience

Disaster Type	Mentioned Had Plan	Used Plan	Mentioned Exercise
Accidents	8	7	1
Large Fires	0	0	0
Flash Floods	3	2	0
Flood	13	10	1
Hurricane	21	20	2

There were four such instances. There could, of course, have been more exercises pertinent to a disaster than were mentioned. The data is quite limited in this respect. As one might expect, all of the instances in which a prior exercise was mentioned were instances in which the existence of an evacuation plan had been made known. It would be difficult to conduct a training exercise without a plan on which to base it. Moreover, all of these instances were cases in which the plan was used in the actual emergency. Put another way, in all six instances in which a plan was said to have existed but was not used, no prior exercise of the plan was mentioned (and, most probably, had not occurred). This would suggest that a plan not exercised by the emergency organization may not be useful in an emergency because too many members of the organization may be unaware of its contents.

With regard to the exercises mentioned, they were uniformly noted to have contributed significantly to the successful conduct of the evacuation. We have already noted the comment of the mayor of Lansing, Michigan that "Years of planning and exercises are paying off". In Petal, Mississippi, where ignition of a leak from an LP gas storage area in August, 1974, led to the evacuation of 3,000 people, the after-action report notes that on-site assistance activities (which involve an EOC exercise) and further testing of the plan in spring 1974 floods (no actual evacuation was required) made local operations "run smoothly".

It is in the case of lack of exercising of the emergency organization that the value of such exercises is most apparent. Two or three instances will be described to illustrate. The Rapid City, South Dakota, flash flood in June 1972, in which 226 were killed with 53 missing, is the first example [12]. The Rapid City-Pennington County Civil Defense Director was stranded at his home in the hills by the heavy rains and was unable to reach the city. Officials were deprived of his knowledge of the plan and of specialized capabilities. The city had a well-developed EOC but responsible officials knew little about its capabilities. City officials mobilized several hours before the flood and knew that evacuation of the river area was essential about an hour prior to the crest. Warnings were broadcast by telephoning the radio station and asking the announcer to make the announcement. The station announcer was not as credible to the public as an official might have been. Many phone calls were received berating the station for exaggerating the emergency. Also, many people had turned off television and radio because of the interference and static caused by the electrical storm. The civil defense sirens were not sounded to gain their attention. Officials said that it never occurred to them to sound them. But the radio station was part of the Emergency Broadcast System (EBS) and the transmitter was equipped with emergency power and a remote programming unit located in the EOC that would have permitted the mayor and the county commissioner to broadcast directly to the public. This capability was not used prior to the main disaster. Shorting of a power transformer about 11.47 p.m., said to be about three-quarters of an hour after the deluge, put the radio station

off the air. About 1.00 a.m. it was realized that the remote program unit existed and that both the EOC and the transmitter had emergency power and only then was communication to the public re-established. Despite these problems 8,700 people who might have been lost were evacuated during the short warning period. Nonetheless, the circumstances suggest that if orientation and training of local officials and emergency personnel had occurred, some of the loss of life may well have been prevented.

A second example is the Van Norman Dam incident previously discussed [30]. The earthquake occurred at 6.01 a.m. At 7.10 a.m. the police captain on the scene below the Van Norman Dam began requesting the people to evacuate. At 8.45 a.m. engineers at the dam recommended evacuation. The assistant chief of police ordered evacuation at 9.05 a.m. At 10.00 a.m. the area at risk was expanded and the evacuation order was changed to advice. Finally, at 10.37 a.m. the area at risk was again expanded and the evacuation order reinstated. Two hours later the evacuation was said to be complete. About 80,000 people were involved. The police force had a general emergency plan and organization and had had a number of tactical exercises. A specific plan for evacuation apparently did not exist nor had one been exercised.* Fortunately, the dam did not collapse. Otherwise, the uncertainties exhibited by changes in evacuation instructions over the 5½ hour period might have been disastrous.

A final example may be drawn from Hurricane Carla in 1961 [27]. Although hurricane evacuation plans did not exist, civil defense evacuation plans for the affected jurisdictions had been completed in 1958. Officials in Jefferson County, Texas, were well aware of these plans and had conducted several exercises of the plan earlier in 1961, including a tactical exercise in July in which emergency units actually assumed their planned positions. In the hurricane evacuation, the same units deployed as the plan indicated and the evacuation was highly successful. Officials reported that the only change made from the civil defense plan was that highways were not made one-way outbound. In Galveston, Texas, a similar plan was not used because local officials were unaware of it. All instructions given there left it up to the citizen to decide whether to evacuate or take shelter. Only 95,000 out of 140,000 chose to evacuate before egress routes were closed by the rising tide. Investigators believed that an exercised plan and an evacuation order would have resulted in nearly the whole population being evacuated.

These examples exhibit the value of orientation and training of decision-makers and emergency forces in readiness for disaster evacuation. They also point to the value of exercising the organization for orientation and training. For the training to be effective, an evacuation plan is essential. Given the plan, the exercise can take on some aspects of a test; i.e., the workability of the plan and its organizational arrangements and the sufficiency of the equipment, supplies, and communications called for or provided can be assessed. Tests and exercises also afford the opportunity to evaluate alternative plan provisions. For both testing and exercising, valid scenarios are needed to present the postulated disaster accurately in its dimensions and pace. Such scenarios permit the exercise of the plan, either in decision-making in command centers or in tactical operations involving actual deployment of emergency units.

In addition to accomplishing necessary orientation and training of officials and emergency forces, these exercises usually identify deficiencies in facilities, equipment, and supplies that can be planned for correction. Deficiencies in the plan, in performance, and in equipment are disclosed in post-exercise critiques in which the participants and experi-

*Although a specific plan for evacuation did not exist, both the police department and the water department had a plan specifying how far people would have to be evacuated if the Van Norman Dam were damaged by an earthquake. The police officer in charge in the area obtained the necessary map from downtown and used it in setting the limits of the area that was to be evacuated.

enced observers discuss their observations. Many such exercises have occurred throughout the country in recent years.

PUBLIC INFORMATION, INSTRUCTION AND DRILLS

The fourth kind of preparedness has to do with measures for informing and instructing the public that may have to be evacuated. In this, effectiveness is measured in terms of giving the public knowledge that they can use in a potential disaster situation as well as in terms of its impact on life-saving responses in an actual disaster. The possibility and appropriateness of drills involving public participation also needs to be considered.

In discussions of preparedness for emergency operations, the terms "test", "exercise", and "drill" tend to be used interchangeably. Used strictly, they are not. A test involves the deployment and operation of the emergency organization in simulated conditions for the purpose of discovering deficiencies with a view toward correcting them. An exercise involves the deployment and operation of the emergency organization in simulated conditions for the purpose of training the personnel with a view toward improving their performance in a real emergency. A drill may be either a test or an exercise with the added feature of the participation of the public.

If public information on how to respond to a disaster threat is to be effective at all, the minimum requirement would seem to call for public knowledge of the existence of appropriate plans, if not of their content in behaviorally useful terms – where to go and what to do. However, for the most part, the evidence in the disaster literature [3, 15, 16, 24] does not support a conclusion that the public, even when informed and instructed under normal conditions, will retain such information. For example, after the disaster of Hurricane Audrey in 1957, Cameron Parish developed an evacuation plan and publicized it widely in the media and through organization of neighborhood civil defense groups. But when Hurricane Carla occurred in 1961, 4 out of 10 residents of the Parish were unaware of the plan or asserted that no such plan existed [16]. In Galveston, 58 percent of the people were unaware of the evacuation plan or thought that it did not exist [16].

There is little doubt – no study seems to show otherwise – that information and instructional campaigns under normal conditions fail to prove effective in affecting behavior in a disaster context. If this is so, then such information, regardless of the mode and intensity of its dissemination, cannot have a positive effect on subsequent responses in the disaster situation itself. This, of course, is a result of the selectivity with which people absorb information. Relevancy to their life conditions seems to be among the crucial factors in knowledge acquisition and retention. Thus, information given publicity at the beginning of the hurricane season may have some impact because of its relevancy but the impact would be short of that associated with specific hurricane warnings to a particular area.

Among the many stimuli which bombard us all everywhere at all times, information pertaining to actions in preparation for low-probability and "unscheduled" (time-unpredictable) occurrences must rate as having low saliency. The motivation to learn and to retain what has been learned – and then be able to use the knowledge in the form of appropriate behavior in coping with these occurrences – is correspondingly low. However, information and instructions, if authoritative and unambiguous, given under threat conditions or at the onset of a disaster are assimilated rapidly and produce high levels of compliance. In slowly-developing disasters, there is relatively ample time for the dissemination of even complex information and instructions. In rapidly-developing disasters, reliance must be placed on the dissemination of that minimal information which is required to lead to effective public response.

Thus, it seems important to prepare essential messages to be disseminated to the public as an aspect of overall evacuation planning, especially in regard to rapidly-developing disasters. But the need for authoritativeness and clarity (and, by implication, message standardization, at least in its *core* elements) in emergency communications to the public makes such information content-and-dissemination planning highly desirable regardless of the time trajectory of the disaster agent.

The extent to which the public can develop more effective modes of coping with a disaster situation by participation in drills (perhaps, of course, coupled with dissemination of other information) is open to serious doubt. In the disasters we have surveyed in this study, public participation in drills antecedent to the actual evacuation never occurred. Thus, there is no way to compare evacuation performance in which there had been prior public participation in drills with that in which there was not. Not only were no instances found in which public drills preceded evacuation in an actual disaster, but we also found no case in which the after-action documents mentioned the need for public drills or recommended them.

The closest that we can come to making a comparison on this point is in considering areas of the country which had been affected by prior disasters of a similar nature, especially those that called for evacuation. In this context, one may then consider the antecedent experience (with an actual prior disaster) to be a "drill" for a subsequent disaster. The results, similar though the situations are, show some of the problems. "We've been through all this before, we can handle it again" is, perhaps, a succinct summary of one of the key attitudes exhibited. But, in reality, it does not follow that prior behavior was as effective as it might have been or that it would be as effective under somewhat different circumstances, or that alternative coping actions would not be preferable. Thus, prior experience leads some to ignore official instructions in favor of personal decision. At the same time, most with prior disaster experience are able to respond quickly to comply with instructions and information given at the time they are needed, so that "learning" in this sense does tend to occur [16].

Another comparison that can be made relates to public behavior when civil defense sirens have sounded an alert in the context of previous routine siren tests [15,24]. Such alerts sounded in this country have all been accidental but the public had no way of knowing this. The practice of audible siren testing introduced ambiguity into the alert message and allowed the public to interpret the event not as a warning of dire emergency but rather as "just another test". In rapidly-developing disasters, such ambiguity could be fatal for some. Just the time spent confirming that the emergency was real and not just another drill could be costly.

The several civil defense tests conducted in the 1950's cannot be used easily as data sources to determine how response effectiveness might be enhanced by public participation in drills. These tests involving public participation were carried out largely as research efforts – to gather data and test elements of the emergency organization. These tests were not designed to inform or instruct the public or even to test complete evacuation plans but rather to provide feedback of data to improve the character of civil defense evacuation plans. Testing of the operating system as an important way of determining problems, evaluating alternatives, and yielding data on possible improvements, is, of course, important. But such testing is now known not to require the participation of the public, and the limitations imposed by such participation, compared with the flexibility afforded by simulated problems, may actually lessen their teaching value for the system.

The possible value of public drills, it appears, is also degraded by the fact that highly-unusual circumstances tend to prevail: a drill has to be announced and publicized in some detail well

ahead of time; a great deal of "tooling-up" by the public can, and does, occur. The situation is more like one of a "game" than of an approximation to reality. The members of the public are so removed from being able to conceptualize the real meaning of the "game" that it is highly questionable whether any learning applicable to an actual disaster can, in effect, take place. When, in addition to that, the operating system is learning too – functioning less than adequately, attempting to identify its problems, and critiquing its plans and their performance – the public visibility resulting from public participation is likely to have a negative, rather than a positive impact on the credibility of instructions in an actual disaster situation.

In emergencies that call for a response by the public, credibility of the source of information and instruction is known to be a major factor in how well and how quickly the public responds. This is especially so in emergencies in which the individual cannot perceive the danger through his own senses. A major consideration in planning for emergency public information activities is maintaining and protecting the credibility of the source of the information and this includes avoiding whatever may degrade source credibility. Public participation in evacuation drills and the inevitable discussion in the media and other forums of the deficiencies disclosed would surely contribute to the degradation of the credibility of the information source. In this respect, a public participation drill can be foreseen to have a counterproductive effect.

Furthermore, the evidence from the limited tests of the 1950's suggests that the social situation itself changes when a drill is attempted. In Bremerton and Spokane, for instance, many people simply stayed home to avoid involvement in the test, with the result that there were unusually light traffic loads and concurrent normal activities. Klass, et al. [13] were led to conclude that "the public participation in 'Operation Rideout' was so small as to imply that even a homogeneous population presented with a logical plan by an organization that it respects as a group of persons, if not an institution, will not fully participate in a civil defense exercise".

Last, but not least, the economic costs and intrusiveness of evacuation drills, even if considered alone and apart from other problems already referred to, may be such as to make their "cost/effectiveness" exceptionally problematic. There is, as it were, no compelling reason to believe that public drills would enhance the population's capacity to cope with disasters more effectively or improve planning and there is fair evidence that the results might well be counterproductive.

IV. FINDINGS AND CONCLUSIONS

Findings

On the basis of the data analyzed in this study, the following findings are drawn:

1. Records of disaster evacuations – as well as of other characteristics, especially antecedent preparatory measures – are incomplete and this introduces uncertainty into analyses of specific aspects of disaster experience.
2. Evacuations of people from danger areas have been routinely successful, even when specific plans for them had not been made in advance.
3. Existence or lack of a plan is most often noted in after-action comments on disasters and improvements in a plan are often recommended by officials and observers. Next most common are recommendations for improvements in equipment and infrastructure. Also noted were exercises of the emergency organization, but in no case was public participation in drills noted or recommended.
4. Familiarity of local officials with emergency plans and capabilities appears the most important desideratum in preparing for evacuation.
5. Preparation of specific evacuation plans is

essential for orientation and training, but if not exercised by responsible officials and the emergency organization such plans are often not used in actual disasters.

6. No record was found of public evacuation drills and there is no evidence that large-scale participation in such drills is achievable. There is some evidence that such participation, even if achievable, could be counterproductive in a subsequent disaster evacuation by introducing misinformation and ambiguity, by limiting response flexibility, and by degrading information source credibility.
7. Intensive efforts to inform the public on evacuation plans and procedures have had limited success.

Conclusions

The following conclusions are drawn from the above findings and from the data analyzed in this study.

1. Responsible agencies of government, such as the Defense Civil Preparedness Agency, should use a standard data sheet similar to that in Fig. 1 of this paper in recording disaster-related characteristics in order to obtain a better basis for improving the ability of government to protect life and property in disasters.
2. A broad and vigorous program of planning, investment in infrastructure and specialized equipment, and orientation and training of local officials and emergency personnel for disaster preparedness, including tests and exercises of emergency plans, is well justified and should be supported.
3. Public participation in practice drills would produce no benefit, may tend to degrade effectiveness, and should be de-emphasized.
4. Efforts on preparedness for disaster should emphasize advance preparation of message content and means of dissemination of authoritative and unambiguous information and instructions in time of need; public information on disaster preparedness in normal times should be limited to that needed to enhance source credibility in the emergency.

APPENDIX A: HISTORICAL INCIDENTS OF PRE-DISASTER EVACUATION

The tables in this Appendix present the applicable data that could be found. These data were obtained for the most part from:

1. Files of the DCPA Disaster Information Center.
2. Hans, J.M., and Sells, T.C. (1974) *Evacuation Risks – An Evaluation*, EPA National Environmental Research Center, Las Vegas, Nevada.
3. Reports of post-disaster studies by DCPA and OEP.
4. Reports of disaster studies by the NAS/NRC Disaster Research Committee and its successors.
5. Reports of disaster studies by the Ohio State University Disaster Research Center.

The data is assembled in this Appendix by type of event that was the proximate cause of the evacuation. The types used are:

Accident. These events are "man-made". They include transportation accidents – water, rail, and highway – explosions in pipelines, buildings, storage facilities, and so on, and such events as leaking storage tanks, etc. Their common feature is that they pose a present or a possible danger of physical harm to people. The dangers include missiles from explosions and the emission of poisonous and corrosive substances.

Fire. These events are either "man-made" or natural. They include conflagrations in urban and suburban areas. They do not include fires in one or a very few buildings. They include forest and other wild land fires.

Flash Flood. Again these events are either "man-made" or natural. Man-made flash floods are those in which a flash flood is – or can be – the result of the failure of a man-made structure such as in the Baldwin Hills Reservoir and Van Norman Dam events in Los Angeles and the Buffalo Run event in West Virginia. Natural flash floods are the result of torrential rains on a relatively small watershed. The two kinds have in common a short build-up and warning time – measured, at most, in a few hours.

Flood. These are natural events. They occur ordinarily on rivers as the result of relatively long periods of rainfall sometimes accompanied by melting of the snowpack. The build-up is slow; it can be perceived in rising river stages; and warning usually comes from observations of the times of the flood crest at upstream points.

Hurricane. These are natural events. They are severe tropical storms whose chief hazards in these days are from the high tides and tidal waves they cause although some hazards still exist from building collapse and wind-borne missiles. These again have slow build-up and the warning time is relatively long. Their location and path are watched by "hurricane

hunters" and well publicized in the media. However, the prediction of the location and timing of the onset of the "eye" of the storm is not as precise as for floods. To avoid unnecessary complication, the two cases of tsunami – tidal wave caused by earthquake – for which data were found are included with the hurricane data.

Where available, data is also included on the following:

Number evacuated: The number of people who moved out of the area at risk by any mode – walking or by auto, public transport, or boat -- and whether spontaneously or in response to advice or direction of the government.

Population: The population reported in the record from which data was extracted. This can be either the total population in the area or the population at risk. Whenever a choice was possible between total population and population at risk, the number at risk is given.

Evacuation Time: The evacuation time given is the total elapsed time, in hours, from the first beginning to the end of the outward movement. In some cases, spontaneous evacuation or "advised" evacuation went on for some time before an evacuation was ordered.

Plan: This refers to the existence and use of an evacuation plan applicable to the evacuated area. In this, we followed Hans and Sells:

P – Plan available, not used
PU – Plan available and used
NP – No plan available

Government Exercise: This refers to an exercise of the organization to test a plan or its readiness to execute the plan or to train it in the execution of the plan. In some cases, it involves activation of the government's Emergency Operations Center (EOC) and simulation of an event. This is similar to a military Command Post Exercise (CPX). In others, it involves actual deployment of the field units of the organization to their assigned posts and the exercise of their operations.

Public Drill: this refers to an exercise of an evacuation plan involving the participation of the public to the extent of evacuating the area. The purpose of such a drill is to educate the public in the detailed requirements of the plan and their proper response to them.

Accident

1961: Aug. 1, Creve Coeur, Illinois (Number evacuated: 7,500), Evacuation time: 1 hr., Plan: PU.

1965: Sept. 9, Baton Rouge, Louisiana (150,000), 2 hr., PU: Sept. 26, Westfire, Oregon (300): Dec. 4, Camden, Arkansas (1,000).

1966: Richland Co., South Carolina (200).

1967: Aug. 27, Texarkana, Texas (5,000), 4 hrs., NP: Oct. 28, Danbury, Texas (1,200): Nov. 18, Waterford, Alabama (2,800).

1968: Jan. 1, Dunreith, Indiana (240): Jan. 13, Chadbourne, North Carolina (1,500), 5 hrs., NP: Feb. 27, Hagerstown, Maryland (2,500), NP: Apr. 21, Kelley, Iowa (240): Aug. 13, Urbana, Ohio (4,000),.3.5 hrs: Aug. 19, Beattie, Kansas (300).

1969: Jan. 13, Lima, Ohio (2,000): Jan. 25, Laurel, Mississippi (1,000): Feb. 18, Crete, Nebraska (400): Apr. 4, Wetamka, Oklahoma (2,000), 8 hrs., PU: Apr. 15, Allentown, Wisconsin (400): Apr. 16, Allentown, Louisiana (150): Apr. 25, Persliing, Indiana (400): May 16, Logansport, Louisiana (1,800), NP: Aug. 24, Piedmont, West Virginia (150): Sept. 3, Wellington, Alabama (200): Sept. 10, Butler, Illinois (700): Sept. 11, Glendora, Mississippi (35,000), 4 hrs., P: Oct. 18, Troup, Texas (100): Nov. 26, Rockwell, Texas (200): Nov. 30, Crew Lake, Louisiana (250): Dec. 29, Carlisle, South Carolina (450).

1970: March 3, Danbury, Texas (300): Apr. 9, New Athens, Illinois (1,500): May 24, Jasper, Alabama (500): June 21, Crescent City, Illinois (600): Oct. 25, Farmers, Kentucky (1,000): Dec. 2, Clay City, Illinois (100).

1971: Feb. 10, Ashkum, Illinois (2,500): Mar. 27, Panther Burn, Mississippi (250): May 2, Eden, Mississippi (200): Aug. 16, Rock Hill, South Carolina (1,000): Sept. 18, Weston, Illinois (150): Nov. 2, Sumter Co., South Carolina (180): Dec. 3, Wheatfield, Indiana (700): Dec. 3, Thomasville Alabama (100): Dec. 11, Corbin, Louisiana (500).

1972: Mar. 19, Louisville, Kentucky (4,400), 3 hrs., PU: May 14, Isleta, Ohio (1,100): May 16, Cashocton, Ohio (350): June 1, Dallas Texas (100).

1973: Jan. 4, Harrod, Ohio (100): Jan. 19, Morgan City, Louisiana (3,000), 4 hrs., PU: Feb. 5, Downingtown, Pennsylvania (700), 2 hrs., PU: Feb. 19, Charleston, South Carolina (2,000): Apr. 20, Williamsburg, Michigan (450): Apr. 28, Roseville, California (20,000): July 17, Superior, Arizona (300): July 20, Superior, Arizona (200): July 30, Markle, Indiana (900): Sept. 13, Adrian, Michigan (1,000): Oct. 30, Edmonton, Canada (5,000).

1974. Jan. 10, W. St. Paul, Minnesota (200): Apr. 23, New York, New York (300): Apr. 26, Chicago, Illinois (400): May 28, New Britain, Connecticut (2,000): June 12, Moore, Oklahoma (5,200): July 11, Leland, Mississippi (200): July 19, Decatur, Illinois (10,000): Aug. 5, Plotona, Illinois (500): Aug. 6, Bluford, Illinois (400): Aug. 25, Petal, Mississippi (3,000), PU.

1975: May 6, Omaha, Nebraska (1,000): May 13, Vierton, Louisiana (1,500): June 23, Calipatric, California (1,200): July 18, Tiller, Arkansas (100): Oct. 23, Fertile, Minnesota (950).

Fire

1970: Sept. 26, San Diego, California (5,000).

1973: Aug. 21, Klamath Falls, Oregon (350): Sept. 10, Whale Gulch, California (200): Oct. 14, Chelsea, Massachusetts (2,500): Oct. 28, San Diego Area, California (350): Oct. 30, Topanga Canyon, California (700).

1974: July 8, Walker, California (400): Aug. 29, Soboba, California (1,000): Aug. 29, Pine Cove, California (1,000).

Flash Flood

1963: Dec. 14, Los Angeles, California (9,000), 1.5 hrs., NP.

1968: July 7, Anderson, South Carolina (210), 2 hrs., NP.

1970: Sept. Payson, Arizona (160), 12 hrs., PU.

1971: Feb. 9, Los Angeles, California (80,000), 5.5 hrs., NP: July 20, Cane Run, Kentucky (1,500), 36 hrs., NP.

1972: Feb. 26, Buffalo Creek, West Virginia (700): June 9, Rapid City, North Dakota (8,700), 1 hr., P: Sept. 13, Hicksville, Ohio (280).

1973: Conway, South Carolina (180): Apr. 12, Greeley, Colorado (1,000), 3.5 hrs., PU: May 7, Denver, Colorado (5,300): May 24, Payson, Utah (5,000): Oct. 28, Ketchikan, Arkansas (350).

1974: June 10, Calion, Arkansas (800): Dec. 1, Mineral Co., West Virginia (100).

1975: Jan. 31, Nacogdoches, Texas (500): May 18, SE Kentucky (1,000): Sept. 22, Rock Hill, South Carolina (250): Sept. 23, Dothan, Alabama (12,000): Sept. 25, Susquehanna Basin, Pennsylvania (20,000): Sept. 26, Alexandria and Arlington, Virginia (250): Sept. 26, Elmira, New York (1,100).

Flood

1951: July, Topeka, Kansas (20,000): July, Laurence, Kansas (2,000): July, Kansas City, Kansas (12,000).

1955: Dec. 23, Yuba City, Marysville, California (30,000).

1959: Mar., King Co., Washington (500), 18 hrs., PU.

1961: June 16, Port Angeles, Washington (100), 2 hrs., P.

1962: Velva, North Dakota (400).

1964: Dec. 22, Humboldt Co., California (180), P.

1965: Apr., Grand Forks, North Dakota (200), NP: June, Littleton, Colorado (250): June, Sheriden, Colorado (200): June, Denver, Colorado (125): June, Newton, Kansas (550): July 24, Middlesboro, Kentucky (700).

1966: Grand Forks, North Dakota (300): Apr., Jamestown, North Dakota (280).

1967: Mar. 7, Harlan, Kentucky (500): July 25, Middlesboro, Kentucky (200): Apr., E. Dubuque, Iowa (200), PU: Aug. 14, Fairbanks, Alaska (14,000), P.

1968: Apr. 4, Russellville, Kentucky (700).

1969: Apr., Jamestown, North Dakota (360), 24 hrs., NP: May, Minoti, North Dakota (12,000), PU: May, Jefferson Co., Colorado (125): Dec. 30, Harlan Co., Kentucky (360).

1971: Jan. 8, Ferndale, Washington (225), 4 hrs., PU.

1972: Apr. 15, Frankfort, Kentucky (8,000): May, Okanogan Co., Washington (1,240), 1.25 hrs., PU: June 21, Isleton, California (1,200), 11 hrs., PU: June 23, Wilkes Barre, Pennsylvania (75,000), 5 hrs., PU.

1973: Feb. 3, Florence Co., South Carolina (100), 8 hrs., PU: Apr. 23, Quincy, Illinois (3,800): Apr. 23, Erie, Illinois (1,500): Apr. 23, Rockford, Illinois (300): Apr. 24, North Coast, Puerto Rico (310): Apr. 24, St. Louis, Missouri (10,000): Apr. 24, Keithsburg, Illinois (700): Apr. 24, Rolling Fork, Mississippi (200): Apr. 25 No. Little Rock, Arkansas (350): Apr. 25, Avoyelles Par., Louisiana (1,110): Apr. 25, Broindette, Louisiana (350): Apr. 25, Bordelonville, Louisiana (210: Apr. 26, St. Charles Co., Maryland (7,050): Apr. 26, Basketown, Missouri (600): Apr. 27, Livingston, Louisiana (880): Apr. 27, Des Allemonds, Louisiana (320): Apr. 27, Point Coupe Parish, Louisiana (310): Apr. 27, Ascension Parish, Louisiana (700): May 1, Jonesville, Louisiana (2,500): May 1, Hannibal, Missouri (35,000): May 4, Penobscot, and Aroostock, Maine (1,700): May 10, Wiggins, Colorado (450): May 10, Atwood, Colorado (280): June 15, Houston Area, Texas (700): June 18, Toledo, Ohio (400): July 3, Delaware Co., New York (500): Aug. 1, No. New Jersey Area (800): Sept. 28 New Cambria, Kansas (280): Oct. 21, Graffon and Cheshire Cos., New Hampshire (200): Nov. 27, Overton Co., Tennessee (200).

1974: Jan. 13, Libby, Montana (1,300): Jan. 15, Siskiyou, California (250): Jan. 15, Ferndale Valley, California (425): Jan. 17, St. Maries, Idaho (200): Jan. 17, Kellogg, Idaho (2,800): Jan. 17, Mossy Brac, Oregon (200): Jan. 17, White Swan, Washington (3,500): Jan. 17, Ebey Island, Washington (520): Jan. 17, Klickatal, Washington (280): Jan. 21, Kankatee Co., Illinois (120): Apr. 8, Monroe Co., Louisiana (700): Apr. 12, Hattiesburg, Mississippi (10,000): Apr. 19, Minot, North Dakota (950): Apr. 19, Koloa and Lani, Hawaii (360): May 15, Philips Co., Oklahoma (420): May 18, Plattee and Clay Cos., Missouri (1,000): May 22, Henry Co., Illinois (170): May 22, Kane Co., Illinois (150): May 22, Kendall Co., Illinois (120): Sept. 2, Prichardsville, Kentucky (180): Nov. 1, Oklahoma City, Oklahoma (10,000): Nov. 2, Yukon, Oklahoma (200): Nov. 4, Tulsa, Oklahoma (630).

1975: Jan. 12, Nome, Alaska (100): Mar. 14, W. Memphis, Arkansas (700): Mar. 23, Rockford, Illinois (2,000): Mar. 25, Paducah and McCraken Cos., Kentucky (700): Mar. 31, Warren Co., Mississippi (2,000), PU: Apr. 19, Lansing, Michigan (1,800), PU: Apr. 29, Minot, North Dakota (4,200): May 8, Minot, North Dakota (250): June 18, W. Great Falls, Montana (4,000), 18 hrs.

Hurricane/Tsunami

1959: Sept. 19, Seabrook, Is., South Carolina (210), 4 hrs., PU.

1961: Sept. 11, Plaquemines Par., Louisiana (21,000), 2 hrs: Sept. 11, LaFourche Par., Louisiana (23,000), 9 hrs., PU: Sept. 11, Grand Isle, Louisiana (2,100), 3.5 hrs., NP: Sept. 11, Cameron Pan., Louisiana (5,700), PU: Sept. 11, Biloxi, Mississippi (15,000), 5 hrs., PU: Sept. 11, Jefferson Co., Texas (108,600), 7.5 hrs., PU: Sept. 11, Chambers Co., Texas (10,000), 7.5 hrs., PU: Sept. 11, Galveston Co., Texas (95,000), 23 hrs., P: Sept. 11, Calhoun Co., Texas (15,100), PU: Sept. 11, Port Aransas, Texas (3,900), 2 hrs., PU.

1964: Mar. 28, Shoreline, Washington (900), 1 hr., PU: Cannon Beach, Oregon (3,100), 1.5 hrs: Aug. 27, Duval Co.,

Florida (12,500), PU: Sept., St. Marys Par., Louisiana (40,500), 8 hrs., PU.

1965: Sept. 7, Florida Keys (8,300), 25 hrs., PU: Sept. 8, Par. near New Orleans (250,000): Sept. 8, Pascagoula and Jackson Cos., Mississippi (21,000).

1969: Aug. 17, Coastal Areas Louisiana and Mississippi (100,000), 12 hrs., PU: Aug., Gulfport, Mississippi (10,000), 7.5 hrs., PU: Sept. 9, Cape Cod, Mass. (250), PU: Sept. 20, Corpus Christi, Texas (135,000), PU.

1970: July 3, Robestown, Texas (450), 1.5 hrs., PU.

1974: Sept. 8, Ploquemine and Camcron Brs., Louisiana (200,000), PU: Sept. 8, Coastal Areas, Mississippi (45,000), PU: Dec. 1, Wildwood, New Jersey (200): Dec. 1, Beach Areas, Delaware (500).

1975: Sept. 15, Puerto Rico (7,000): Sept. 22, Coastal Areas, Louisiana (32,000), PU.

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THE PROVISION OF PRIMARY CARE DURING A PERIOD OF NATURAL DISASTER OR LARGE SCALE EMERGENCY

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We live in a potentially disastrous age. The recent earthquake in Guatemala and the threats of earthquakes in California, the possibilities of flooding of major rivers in the United States, the incidence of hurricanes and tornadoes, the awesome threats of atomic disaster – all these are part of the hard facts of our times. A community that has suffered and lived through a disaster can become, when properly studied, a "disaster laboratory" from which much can be learned. The delivery of primary care under such conditions of extreme stress – when disaster paralyzes the providers of care – is of special interest. The results of a recent survey study and sample survey by Health Care Management Corporation, analyzing the impact of the 1972 flooding of the Wilkes-Barre/Wyoming Valley area of Pennsylvania as the result of Tropical Storm Agnes, point to some pertinent conclusions on these matters.

How did approximately 300 physicians in this area react in such a situation of stress? Not only had the flood eliminated their usual place of business (direct damages by flood waters included the offices of over 130 physicians), and seriously affected their personal lives (many had to evacuate their homes), but consumers of health care – the affected population – also had their personal and business lives affected in the same manner. The HCM study found that, under the most intense stress, even when faced with incredible demands, physicians who are by profession trained in "the medical emergency" could be counted on for true leadership. In the Wilkes-Barre situation, they were able – despite the lack of a comprehensive delivery plan and under conditions of extreme confusion – to deal capably with a demand for service two or three times that of the normal population demand for medical care.

It was also observed that, although emergency planning might establish "new" centers for primary care treatment services – evacuation centers, packaged disaster centers, and so on – both patients and physicians tended to rely on the existing system as they knew it, for both the demand and supply of services. Patients gravitated to their usual sources of medical care (for example, 62.4% of those seeking a physician's care went first to his "office", even though most of those offices were flood hit), rather than seeking out new points for provision of service. As for the physicians, they identified strongly with the hospital as the point of delivery of medical services and, within that structure, they were able to increase the efficiency of their practices in the crisis situation so as to accommodate a major increase in the demand for their services. Let us have a look, then, at what actually happened in this unusual situation, in which the health care personnel and facilities, at the time they were needed most by the affected population, were

themselves disrupted and malfunctioning during the height of the flood emergency.

DISRUPTIONS

Nowhere else in the country did the damage from Tropical Storm Agnes, June 22, 1972, even approach the widespread devastation wrought on the Wyoming Valley in Northeastern Pennsylvania. Although the flood primarily affected Luzerne and Wyoming Counties, which have a combined population of 360,000, its impact was mainly centered in the Wyoming Valley section of these two counties along the Susquehanna River. Estimates showed that the raging flood waters had damaged over 80% (roughly 21,000) of the 25,000 housing units in the area, with over 15,000 of these sustaining major damage; caused a half-a-billion dollars worth of physical damage; and dislocated between 70,000 and 80,000 people. Almost all services came to a standstill; broken power lines and mass media offices under water crippled communications. Businesses and industrial services were closed, with a consequent sudden loss of many jobs.

The breakdown in normal commercial activity was complete, including the entire downtown business district in neighboring Kingston and five suburban shopping malls. Seventy-two thousand people had to be evacuated; 34 public schools, 14 private schools and 3 colleges sustained damages amounting to US $ 52,700,000; damages to roads and bridges amounted to US $ 50,000,000; 11,335 jobs were affected by the devastation. Direct damages to the health providers and facilities included the offices of more than 130 physicians (*American Medical News*, 1972), 55 dentists, 50 pharmacists, and public health structures.

The two hospitals and five nursing homes that were evacuated had neither sufficient warning of the impending flood nor a coordinated emergency plan to implement in case of such a disaster, even though the Valley had sustained repeated flooding in past years. In 1784, 1786, 1842, 1846, 1850, 1865, 1893, 1901, 1902, 1936, and 1955, flooding occurred as a result of spring thaws or hurricanes and tropical storms. The Valley is directly in the path of water flowing from mountains in upstate New York (Luzerne County Historical Society). When these institutions were notified and advised to evacuate early in the morning, some few hours before the 37-foot river dikes were topped, they were as ill-prepared to relocate their patients as the other institutions were to receive these patient evacuees. In all, 40% of the hospital beds in the area were out of service during the flood crisis. The two evacuated hospitals listed their losses at approximately US $ 10,000,000. Care for the elderly was at a premium because of the shortage of skilled staff and intermediate level facilities to substitute in supplying a continuing adequate level of care. Medical records were destroyed, pharmacies were inundated, and all lines of communication were non-functioning. Tragically, the emergency communications equipment, stored in the basement of the Civil Defense Building, was located on the river bank. It was one of the first systems to be flooded.

Loss of Physician Offices, Hospital Beds, Displacement of Population

Approximately 155 physicians in the Wyoming Valley – over 50% of all those in the area – were directly affected by the flood (that is, either their homes or offices, or both were seriously flooded). Up until the first week of July, the identification of these flood-affected physicians and a determination of their location was a major task. (The Luzerne County Medical Society later reported that of these 155 doctors, most suffered major damage to their offices; 37 had offices on upper levels of multi-storied buildings, but lack of telephone and electrical service prevented them from returning to their offices.) Thus, most had their offices flooded, records destroyed or water-

damaged, and equipment ruined. And all those affected faced important decisions, some of which were: (1) to restore their pre-flood offices, (2) to re-locate to undamaged facilities, (3) to leave the area, and (4) to retire. Despite these difficult personal dilemmas, a large number of Luzerne County physicians continued to deliver primary medical care under these extraordinary conditions.

Incidence of Illness Requiring Medical Attention

The flood did indeed act as a precipitating factor in help-seeking: 58.9% of those persons whose homes were flooded sought medical help (as opposed to 27.8% of those whose homes were not flooded). In terms of sheer numbers, this meant that approximately 50,000 persons needed to be served in some way by a crippled system. A further complication was an unusual demographic characteristic: those persons situated in the flood plain were disproportionately represented by age: more than 14% of those evacuees who were neither hospitalized nor in a nursing home were 65 years of age or older. Many had little warning of any kind about the flood, and many of those in the general population who were then under a physician's care left their prescription medications behind when they evacuated their homes. The stress of such a trauma acted to aggravate existing chronic conditions. Emotional upheavals were catalyzed by the upsets of friends and the loss of property to the flood waters. How then, did this health system, itself in crisis, provide adequate care to those thousands of persons whose lives were threatened and disrupted by a disaster of these proportions?

SURVEY OF FLOOD VICTIMS

Trained researchers conducted personal interviews with the head or the spouse of the head of each household in the survey. A stratified random sample (N = 267 families – 801 persons) was drawn from the flood plain and surrounding areas of Wyoming Valley. The sample was stratified by urban-rural designates and probable economic status, and represented approximately 1% of the 72,000 persons affected by the flood. This survey was performed in partial fulfillment of Contract No. HSM 110–71–234 with the Department of Health, Education and Welfare.

The test instrument was designed to elicit responses concerning the barriers to health care over selected time periods: during the flood crisis, two months to one year after the flood, and two years after the flood, in order to assay any lingering after-effects directly attributable to the flood. The survey instrument also contained general health data, which was administered to a control group of 1,340 families. Some lived in the general Valley area, but the majority of control group respondents resided in surrounding counties in Northeastern Pennsylvania: Carbon, Lackawanna, Luzerne, Monroe, Pike, Sullivan, Wayne, and Wyoming. These statistics allowed an extensive and reliable comparison measure of the health status in similar regions, as well as in those areas geographically linked to the Wyoming Valley. In this way, those respondents who were not situated directly on the flood plain but who may have been affected by the flood in terms of continuing health care, consumption of goods and/or utility services were also included in the assessment.

The User: The Needs of the Disaster Victim

In the survey, 18% of those persons involved in the flood had some type of ongoing health problem for which they sought treatment; 24.7% had upper respiratory infections; and, 14.7% had hypertension problems. The rest of the respondents cited a variety of ills, many of which were chronic diseases for which they were receiving prescription medications. Despite the lack of medical records and the destruction of local pharmaceutical supply houses, a mere 3.1%

of these persons had difficulty in getting their prescriptions filled.

A substantial (67.9%) group of persons who claimed to have needed medical attention during the crisis period contracted their illness in the seven days that the area was under water. For 37.3% of these, the illness lasted for those seven days; however, 28% stated that they were still suffering from the same problem during the time the survey was conducted (1974). More than one half of these attributed their health problem directly or indirectly to the flood.

RESULTS

The overall conclusion of the survey was that both providers and patients relied on the traditional system rather than establishing new treatment points; population and physicians preferred to use existing centers within the existing medical systems.

Impact of Flood on the Population

1. From HCM's flood survey, of those who had a health problem one to three days during and after the flood, 24% suffered from upper respiratory infections and 13% suffered from high blood pressure, nervousness, or tension respectively.

2. Seventy percent of the health problems reported occurred one week or less after the flood.

3. Fifty-nine percent of those surveyed who acknowledged any health problems during the flood reported that these were caused by the flood.

4. Eight percent of those surveyed indicated that their families had received adequate medical care between June 23 and August 30 and after the flood.

5. Of those who tried to contact their doctors during the flood and evacuation period, i.e., June, July, and August of 1972, 75.6% indicated that they saw him in two days or less.

6. Statistics showed that the population preferred and utilized their usual source of care instead of such transient sources as evacuation centers, etc.

Response of the Hospitals

1. An emergency hospital was set up in Misericordia College and staffed with Emergency Room doctors from Nesbitt Hospital, which had previously been evacuated.

2. The Emergency Room at Wilkes-Barre General Hospital evidenced a 300 to 400% increase in the volume of visits. Pre-flood volume had averaged 60 encounters a day.

3. During the period from June 23 to July 4, 1972, 5,000 patients were seen at the Wyoming Valley Emergency Room. Pre-flood volume had been about 1,000 visits a year.

Response of the Physicians

It is apparent from a Luzerne County Medical Society survey that many of the flood-affected physicians, having no disaster plan to follow, and no office from which to treat patients, went to their usual place of work – the hospital. The Luzerne County Medical Society findings, released on July 8, 1972, showed that of 82 flood-affected physicians which they could locate, 10 were practicing out of Wyoming Valley Hospital; 29 were at Wilkes-Barre General Hospital; 19 were at College Misericordia; 6 were at a Family Practice Clinic (Wilkes-Barre); and, 18 were at other locations (not identified, possibly evacuation centers).

Effectiveness of the Physicians

The following statements are the results of a household survey administered to a sample of flood victims from Wyoming Valley. An analysis of these statements demonstrated that the physicians were available during and after the flood, and that the quality of care provided did not decrease, despite the physical and mental challenges of the situation.

1. Of those interviewed, 23.3% replied that they *did* try to contact their physician during the time of the flood crisis (less than two months after the flood).

2. Of that 23.3%, 83.4% contacted their regular physicians and 88% saw them.

3. Thirty-five percent of the respondents indicated that they did evacuate during the flood. Of these, approximately 80% were aware of sources providing emergency medical care.

4. Within a year after the flood, 62.4% of those who sought medical help went to a private physician. The most frequent reason why they chose that particular source of care was because it was their *regular* source of care. Even though the majority of persons were aware of the evacuation center as a source of care, most still chose to go to their own physician, even though he may have been caught in the flood himself. Twelve percent of the patients obtained help at hospitals, and a surprising 10.6% at nursing homes. Evacuation centers were used as a "last resort" for medical attention: only 1.4% went there for aid.

Later Response of Physicians

In the survey, respondents were asked if they had tried to contact their physicians during the time period of two months to one year after the flood and, if so, had they been successful in seeing them. Twenty-eight percent answered affirmatively; of those, 59.6% were seen by their physicians immediately, 21.1% within three days, and 19.3% in one week. This indicates that considerable back-up in scheduling may have been occurring, possibly due to the damages sustained by doctors and patients during the flood.

An illustration of this phenomenon is the fact that more than 75% of the Valley residents were definitely aware of their physician's status and location during and after the flood crisis. A small percentage (8.6%) tried to contact another doctor when they were unable to reach their own physicians during this period. More than 80% of these respondents were able to see the alternate doctor, and nearly two-thirds of these persons were seen immediately. Even though offices were flooded, records destroyed, and communications still in a state of semi-repair, a satisfactory level of primary care was being maintained.

CONCLUSIONS

As a result of these studies, it may be concluded that the physicians involved in the Wyoming Valley disaster responded extremely well under conditions of extreme pressure. The response was chosen in terms of the existing system, following the usual and customary methods of operation. It may also be concluded that the patient's choice in a chaotic situation is to identify with stable, already existing sources of medical care. Therefore, we may assume that disaster planning should make maximal use of existing health care resources, since it is difficult to change patterns of behavior during periods of shock. Future plans should rely on existing health care systems as much as possible.

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VOCAL ALARM SYSTEMS FOR HIGH-RISE BUILDINGS – A CASE STUDY

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In a time when sophistication concerning water delivery, smoke control, and fire fighting strategies in general has truly matured, it is deplorable that knowledge about human factors under fire conditions remains primitive. Few studies have addressed the problem of human behavior in building fires, particularly fires in high-rise structures. In an excellent review of the literature related to various aspects of fires in high-rise buildings, Rubin and Cohen (1974) summarized their findings by commenting that "the most striking feature which resulted from the review of psychological material was the dearth of relevant data" (p. 19).

Serious fires in high rise buildings are unfortunately all too common. In January 1970, a fire in the Conrad Hilton hotel in Chicago claimed two lives and hospitalized thirty-six people. In the summer of that same year a fire in the 50-story New York Plaza building killed two and injured thirty while causing almost 10 million dollars worth of damage. In February 1972, a fire in the 31-story Andraus Building in Sao Paulo, Brazil, killed 16 people and injured nearly 400 others. Finally, in South America from July 1973 to February 1974 there were 3 major high-rise fires resulting in 183 fatalities and nine million dollars in damages (Sharry, 1974).

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Fire in high-rises is a problem for safety experts. But when building codes are written, sprinkler systems installed, and architects have finished overseeing construction, fire-safety becomes a problem of people: how to inform them in emergencies, how and how many to evacuate, how to forestall panic, in a word, how to teach people to survive. While experts have not been specifically trained to deal with human problems during fire emergencies, several research areas of psychology provide information that can be applied to questions of human behavior in such emergencies. Findings from social, cognitive, and human engineering psychology suggest types of instructions which should be most effective in eliciting desired responses during emergencies as well as how people might behave under ambiguous, stressful situations. The present study suggests how such findings can be applied to the development and evaluation of vocal alarm systems in high-rise structures.

THE PROBLEM

The initial ideas for a public address warning system for use in fire emergencies emerged from the International Conference on Fire-Safety in High-Rise Buildings, held in two sessions during 1971 (Proceedings, May and October, 1971). During the first sessions, a panel on Occupant Protection recommended that during an emer-

gency, if an occupant is ". . . reassured and informed by a public address system or other means, he is less likely to become excited or apprehensive" (p. 4–10). A total public confidence system was recommended which would include a communication network that might be activated manually or automatically to communicate with building occupants affected in an emergency situation (p. 4–12). In his examination of psychological factors related to occupant protection during fires, Gilbert Teal stated that automatic voice tapes capable of transmitting pre-recorded instructional messages to emergency areas should be an essential component of an effective warning system (p. A–19).

Consequently, a task force on emergency communications established at this meeting considered as its primary purpose the development of a total protection system involving oral communications. In describing such a voice alarm system (VAS), this task force highlighted the following characteristics:

(1) A voice alarm system can give precise instructions under varying emergency conditions (e.g., fire, bomb threat).

(2) Instructions can vary for different zones of the building.

(3) Recorded alerting sounds can capture attention of the people and alert them to emergency at hand by pre-conditioning.

(4) Pre-recorded messages can be used for pre-planned conditions.

(5) Pre-recorded voice announcements can be used automatically to respond to manual or automatic fire alarms.

(6) The voice system can be used to modify or update information.

(7) Number and types of speakers is dependent on the situation of the area covered.

(8) A voice alarm system may be combined with a music/paging system. If so the music system can be turned off and the emergency announce system can operate at predesignated volume levels.

(9) Manual voice directions can override or cancel automatic voice transmissions (p. 71-EC-3).

While the recommendation of a VAS was based on the combined experience of the assembled fire-safety experts, the actual definition of the most effective instructional messages, warning signals, voice qualities, etc., was not determined. While there was agreement that attention must be given to occupants' perceptual responses to auditory and visual signals, as well as to the social forces acting upon individuals during emergencies (Rubin and Cohen, 1974), research on these aspects of emergency behavior was sparse.

The General Services Administration of the U.S. government devoted its energy to plan a high-rise structure that would incorporate the recommendations for a total fire-safety system in its design. The 37-floor Seattle Federal Building was designated to be the model structure. The basic hardware of the fire-safety system was installed and several important decisions concerning personnel evacuation plans were made. First, fire-safety officials had decided that total evacuation of the building would be dangerous as well as impractical during fires. Instead "area evacuation" was recommended which meant that during fires only the affected and adjacent floors of the building would be evacuated. Secondly, the paths of area evacuation called for upward as well as downward personnel movement. Finally, and most importantly for our interests, it was decided that the evacuation plan required a system which included a public address component capable of broadcasting pre-recorded taped directions to communicate with building occupants who might be affected by a fire.

While the hardware of the Seattle Federal Building was designed to incorporate the nine characteristics of the VAS described above, actual definition of the most effective warning signals, instructional messages, and voice qualities of the communicator were yet to be determined. As psychologists we were asked to make recommendations concerning each of these aspects of the system.

ALERTING TONE

Recommended as essential for a VAS was an alerting tone which could capture the attention of occupants and alert them to attend to subsequent directions which would affect their movement during an emergency. For use as such a signal we recommended that the U.S. Federal Communication Commission's 1000 Hz pure sine wave tone warning signal be used. In the U.S. this signal is currently used by the Emergency Broadcasting System to precede important announcements of emergency situations over designated radio stations. Normal radio broadcasts are interrupted by the tone and emergency announcements immediately follow.

Rationale

According to the *Human Engineering Guide to Equipment Design* (1972), the human ear is most sensitive in the range of 500–3000 Hz The FCC tone falls comfortably in this range. The *Guide* further suggests that an oscillating tone provides a good warning signal when it must be presented over an intercom system. The FCC tone is oscillating. Finally, the *Guide* recommends an intermittent, pure tone signal if speech is necessary. As speech is one of the major components of the VAS, the FCC tone is ideal.

The 1000 Hz tone at @ 95 db. further satisfies the requirements specified in *Occupant Behavior in Building Fires* (Rubin and Cohen, 1974), that the tone is intense enough to be sensed, but not so intense as to cause permanent damage. Finally, such a signal should be appropriately interpreted as a warning tone, always followed by information directing the occupants about what to do next.

A more comprehensive statement regarding the qualities that should be part of an effective warning system can be found in *Human Factors Engineering* (McCormick, 1964). According to this source (p. 171–172), an audio warning signal should have the following characteristics:

(1) audible (heard above background noises);
(2) quick-acting (capable of evoking a quick reaction);
(3) alerting (catching people's attention);
(4) discriminable (easy to differentiate from other signals);
(5) informative;
(6) compatible (consistent with others in use);
(7) non-masking (not prone to interfere with other functions by drowning other audio signals);
(8) non-distracting (not startling);
(9) non-damaging (not cause irreversible damage to hearing).

When held up to these criteria, the FCC signal is an efficient device for alerting occupants to an emergency.

(1) The audible character of the signal will be secured by setting the sound-pressure delivery of the signal sufficiently above the expected ambient noise level. This would be at about 25–30 phons above the expected ambient noise level of approximately 65 phons that is usual for open office space.

(2)–(6) The FCC signal evokes quick action (attention to the message which follows) once occupants are trained to its use. Its purpose is to alert, and it will be used only in those circumstances demanding such an alert. The signal is compatible with the use currently made of it, namely, alert to an emergency. It is informative in that it will always signal an alert, and it is easily discriminable in that no other sounds that are likely to occur are similar to it. Finally, the connotation of the signal is already reasonably well understood.

(7) At the proper loudness level, the FCC tone is not likely to interfere with other functions. For example, it would be possible for someone speaking loudly to give verbal instructions during the tone if such instructions were necessary.

(8)–(9) The pain threshold for sound is about 120-140 phons. If the tone is delivered below this level (predicted delivery would be at about 90–95 phons) the audio signal would be harmless to human hearing.

A final advantage of the FCC tone is that it capitalizes on the pre-conditioning of the occupants to this signal as an emergency warning. Such pre-conditioning would be desirable as is implied by the report of the task force on emergency communication systems at the second session of the International Conference on Fire-Safety (p. 71-EC-3).

There is one potential cause for concern. Since the FCC tone on the radio is typically used in conjunction with a "test", "false alarm behavior" might be evoked when the tone is used in a VAS. Occupants might assume that "this must be a test, just like on the radio," and simply ignore the tone. In our opinion, such false alarm behavior would not be evoked since the immediate announcement following the tone will indicate that a fire evacuation procedure is in effect. This vocal message is markedly different from the silence that is usual following radio transmissions of the signal.

VOICE QUALITIES OF COMMUNICATOR

An important consideration in the design of the VAS was what type of voice should present the instructional messages delivered to the occupants. It was recommended that the emergency announcement be introduced by a female voice, and that the instructions themselves be delivered by a trained male voice which was authoritative, calming, and not concentrated in the bass range.

Rationale

Research suggests that switching from a female to a male voice will be noticed even when people are not really paying attention (Cherry, 1953; Cherry and Taylor, 1954). Such a switch will get through the "attentional barrier" of occupants who may be absorbed in conversations or their work.

A second reason for introducing the message with a female voice was related to the recommended alerting tone. Since use of the FCC warning signal may be preconditioned to an alert situation which never materialized in an actual emergency, such pre-conditioning could lead occupants to ignore the signal. The introduction of a female voice after the signal is dramatically different from the male voice that typically announces the FCC warning. This difference should eliminate even the small possibility of false alarm behavior, particularly since the signal is only used to tune people into the information that follows the signal (cf. Baker and Mack, 1960).

The instructions which are delivered should instill confidence that the communicator knows the situation and knows what should be done. At this stage in our society, males are stereotypically looked to as the ones who take charge in an emergency. Relying on this stereotype (however unjustified), a male voice was recommended for most of the directional delivery. In addition, the voice should be trained and exercised in the use of clear diction so that the information will be received clearly. The voice should also be calming since in most situations the avoidance of panic will be at least as important as the rapid dispersal of occupants from troubled floors. Finally, a higher ranged male voice was recommended since the majority of the message delivered by such a voice will reside in the 1000+ Hz range; this range is considered to be the most easily understood range of voice delivery.

After an auditioning procedure was conducted, a member of the Screen Actor's Guild was selected for the female communicator, and a radio announcer from a local radio station was selected as the male communicator for the system in the Seattle Federal Building.

EMERGENCY MESSAGES

In this section examples of the messages along with the rationale used in their composition are presented. The first example is the message sent to the building's elevators at the time a fire is reported. Next, we present an example

of the messages sent to the occupants of the fire floor; for present purposes we assume a fire has been reported on the twelfth floor.

Elevator Message and Rationale

A modern "improvement" in elevator cars is the self-service elevator which is controlled by a computer and responds to the touch of a finger. The call buttons on these elevators are frequently heat- and pressure-sensitive. Consequently, when a fire occurs elevators may go automatically to the fire floor. In a recent fire in New York City three people took an elevator down from their offices in an attempt to escape from a fire. The elevator stopped on the fire floor, whereupon the doors opened, became warped from the heat and all three people died on the floor of the elevator that they thought was their vehicle to safety.

To correct for this potential problem a fire alarm in the Seattle Federal Building triggers an automatic capture of the elevators to the lobbies. Consequently, the "captured" occupants of these elevators need the reassurance of a quick message which will enlighten them about the situation.

The occupants of each elevator will receive the following message while the elevator is returning to the lobby:

> (Female voice) "May I have your attention please." (Male voice) "The building manager has directed all elevators to the entrance lobby. There has been a fire reported in the building, and the elevators may be needed. Please proceed to the lobby area for further instructions."

Several aspects of the message should be noted. The message tells the occupants (1) what is happening to the elevator, (2) why this is happening, and (3) what they are to do next.

The statement that the "building manager has directed all elevators . . ." gives the impression that an actual person is in control of the situation. In time of emergency most people would prefer that someone in authority personally take charge. The reference to "all elevators" is made so that the elevator occupants do not feel their elevator has been singled out for special treatment.

The occupants are told that there has been a report of a fire, rather than the more ambiguous term "emergency". The use of less ambiguous terminology to explain the situation to the affected people was suggested by research in social psychology which examined how people respond in simulated emergencies (Latane and Darley, 1970). It was the conclusion of this line of research that when people are in groups they tend to shunt responsibility for action to other members of the group. Such a failure to respond is especially noted during ambiguous situations. At such times people seem to look to others for cues on how to behave. It has been estimated (Phillips, 1973) that 15–25% of the population may perceive an emergency situation improperly and resort to some totally irrelevant negative mode of response. In an ambiguous situation if such improper responses become models for others to follow, the results could be potentially tragic. Consequently, it was decided to avoid any ambiguity in the delivery of the message.

"Fire" is the true situation; elevator occupants can then disseminate this accurate information to prospective elevator users in the lobby rather than create some vivid rumor which could induce a panic situation. And finally, the fact that the elevators "may be needed" should have a calming effect while it provides a perfectly rational argument for the redirection of the elevators to the lobbies.

Message to the Affected Areas and Rationale

When a fire is reported on any floor, several messages need to be transmitted. The occupants of the fire floor need to be told the facts and instructed where to go. The adjacent floors need to be cleared, and thus their occupants must also be given instructions. And finally, a message must be broadcast to the "receiving"

floors where the occupants of the evacuated areas are sent.

One important constraint imposed by the system's hardware capacity was that the three messages to the affected areas be recorded successively on a single tape, and take no more than 100 seconds. Since the messages sent to the fire floor, and to the floor below and above, are the most important, they receive a larger proportion of that 100-second allotment. During an emergency such messages must be quickly delivered, so such time constraints did not hinder the effectiveness of the emergency messages.

An example of one such message sent to a fire floor and the rationale used in its development follows. Similar messages and rationales were created for each of the affected floors.

> (Female voice) "May I have your attention please. May I have your attention please." (Male voice) "There has been a fire reported on the 12th floor. While this report is being verified, the building manager would like you to proceed to the stairways and walk down to the 10th floor. Wait on the 10th floor for further instructions. Please do not use the elevators, as they may be needed. Please do not use the elevators, but proceed to the stairways."

Several aspects of the message should be noted. The message tells the occupants (1) exactly what has happened, (2) what they are to do, and (3) why they should not use the elevators. It should also be noted that all essential instructions are repeated twice: two times it is pointed out that the occupants should proceed to the stairways, that the 10th floor is the place to go, and that the elevators should not be used. Numerous research studies have shown that repetition facilitates understanding and recall (Kruger, 1929; Hebb, 1961; Waugh, 1963).

It should be further noted that relatively common words are used in the message. Research has shown that words that are used commonly are more easily understood (Howes, 1957). This empirical finding is restated by the *Human Engineering Guide to Equipment Design* (1972) which states "other things being equal, the more frequently a word occurs in everyday usage, the more readily it is correctly identified when transmitted over a speech communication system" (p. 219). The word "evacuate" is never used since it may connote to some of the occupants that they should leave the building. And finally, a rationale is given why the elevators should not be used, making it less likely that occupants will attempt to use them.

The messages to the other affected floors are similar to that delivered to the fire floor. One important change is added to the message delivered to the floor above the fire floor. The evacuation plan calls for the removal of the floor above the fire floor upward one floor. Natural inclination and training has made such movement unusual to say the least. Consequently, while the message is essentially the same as the fire floor's, the added phrase that the floor above was a "safe area" was included. This inclusion was made to encourage personnel to confidently follow the directions as announced.

METHOD OF EVALUATION

As with any system that is new, the VAS in the Seattle building needed to be tested under simulated emergency conditions to determine if what looked good on paper but was derived from related but independent research would effectively work under actual evacuation conditions. Such tests were conducted during the first week of occupancy of the new building.

Two fire drills were conducted during a period of one hour. There were two sections of the building (floors 20–24 and 14–18) whose occupants had fully moved into their new offices and were being visited by their clients. Two floors (16 and 22) were targeted as the floors on which a fire would be reported for purposes of the drill. Because of evacuation patterns used during emergencies, a fire reported

on these two floors would affect floors 14–18 and 20–24 either as floors to be evacuated or as receiving areas for evacuated personnel.

Orientation

The general safety plan for the building provided that all regular employees be given a training session which would explain the alarm system and emergency area evacuation procedures. For purposes of the evaluation, only the occupants of floors 20–24 were given such training on the day prior to the scheduled drills. No instructions on the new alarm system and evacuation were given to occupants of floors 14–18. Consequently, one drill would be conducted for personnel instructed about the vocal alarm system, and the other drill would be conducted for personnel with no prior instruction. Neither group was told that an emergency drill was planned for the near future.

Alarm

A fire alarm was turned in on the 22nd floor at approximately 3.15pm. This alarm triggered the entire emergency procedure including capture of the elevators to the lobby, and automatic message transmission to floors 20 to 24. When this drill was completed and personnel returned to their own floors, another alarm was turned in at approximately 3.40pm on the 16th floor effecting the elevator capture and the area evacuation of the fire floor and floors adjacent to it. Additional messages in both instances were broadcast to the receiving floors informing their occupants of the emergency and directing them to remain at their desks. To lend realism to the drill, firefighters in full firefighting outfits were dispatched to all floors involved in evacuation procedures. These men stationed themselves in conspicuous positions so that they were visible to most of the employees during the evacuation.

Evaluation Instrument

In addition to the observations made by the investigators, GSA personnel, and the Seattle fire department, questionnaires were distributed to all those involved in the drill after the "all clear" was broadcast. Two-hundred and five questionnaires, each with 16 questions, were returned by participants in the drill. This represented about 90% of the people affected by the alarm.

In completing the questionnaire respondents were asked to indicate where they were when the drill sounded, where they went during the drill, how the message directed them to go, if they needed assistance in understanding the directions of the messages, and the reason they were asked to evacuate their floors. The second part of the questionnaire consisted of eleven questions designed to assess the quality of the warning tone, voice of the communicator, content of the message, and how the VAS compared with other emergency drills. For each of the eleven questions the respondents were asked to check one of five possible response categories on a continuum that ranged from strongly agree to strongly disagree. These items were:

(1) The warning tone preceding the message was audible.

(2) The warning tone alerted me to listen for an announcement.

(3) The voice that announced the emergency was clear and distinct.

(4) The message was loud enough so that I did not have to strain to hear it.

(5) The message was too loud.

(6) The instructions concerning what you should do in the drill were clear.

(7) The reason for the evacuation was clear from the message.

(8) I feel that the message inspired confidence that the emergency was being handled properly.

(9) I found that the message concerning the emergency was calming.

(10) This fire drill was less confusing than most other fire drills I have been in.

(11) I would prefer this vocal alarm system to the bell alarm system to signal an emergency.

The answers of all respondents as well as the observations of the evacuation procedures were used to complete the evaluation of the vocal alarm system.

RESULTS

Observations

General Service Administration and Seattle Fire Department personnel were positioned on every floor affected by emergency evacuation procedures. There was a clear consensus that the vocal alarm system created minimum confusion and effected 100% evacuation of personnel directed to vacate their floors. All floors targeted for evacuation were vacated by visitors and federal employees within 1½ minutes after the alert tone was sounded on a floor. Personnel unhesitatingly went to the stairwells to evacuate, no-one attempted to use the captured elevators, nor was there any pushing, running, or other panicky behavior observed. Chief Graddon of the Seattle Fire Department summed up the observers' impressions when he offered that it was the smoothest fire drill he had witnessed in his years with the fire marshall's office in Seattle.

It should be emphasized that none of the participants in the drill were alerted to the fact that a drill would be conducted in the building. It should also be noted that there were no observable differences in the behavior and evacuation between persons given prior orientation about the new alarm system and those provided with no such orientation. From these observations, it seemed that the vocal alarm system itself was principally responsible for the swift and smooth area evacuation of personnel.

Questionnaire Evaluation

As was mentioned above, 205 respondents completed questionnaires evaluating the alarm system and evacuation. Of these, 145 were collected from people who were asked to vacate their floors; the rest were received from personnel on the receiving floors. Ninety-seven percent of the vacating population indicated correctly the floor to which they were asked to move, that they went where the message directed, that they needed no help in understanding the message, and that they understood the reason for the evacuation. Those four people who missed one or other of these questions seemed to misread the instructions on the questionnaire. Ninety-five percent noted that they were instructed to use the stairways to vacate. Of the seven who did not correctly respond to this question, five were on floors which had received no prior orientation but where no-one was observed trying to use elevators to vacate.

Responses to the eleven questions assessing the VAS conveyed an overall feeling of confidence and satisfaction by participants in the drill. From responses to the two items concerning the warning tone, participants seemed in agreement that the tone was audible and alerted them to listen for an emergency announcement. It should be noted that while the question concerning the audibility of the tone was similarly responded to by those who were and were not oriented to the new alarm system, those who were not oriented seemed slightly less sure of the purpose of the alerting tone. However, it was interesting to note that those without orientation did seem to recognize the alerting nature of the tone. It is possible that, as we had predicted, a transfer of their experience with the alerting nature of the FCC tone to the tone used in the VAS took place.

The loudness and distinctness of the message was judged positively by all floors with the exception of the 24th, a receiving floor, whose response was one of uncertainty. On the 24th floor it was determined that several of the new

speakers were not functioning properly; they have subsequently been repaired, and now there is no problem with the audibility of the messages. Again there were no noticeable differences between floors receiving orientation and those that received no such orientation. The same positive response pattern was noted to questions concerning the clarity, rationale, and confidence of the messages with no noticeable differences between oriented and unoriented floors detected.

Question nine, which asked if the message concerning the emergency was calming, received an average response of "disagree". As was noted by participants in the comment section of the questionnaire, the reason for such a response is obvious: "No message can be calming when announcing a fire on your floor." That an announcement of a fire should be calming is not a realistic expectation of any alarm system. In the light of answers to the other questions on the instrument, a negative response to this question should not be construed as a negative assessment of the VAS, but rather a judgment on the credibility of the drill as simulating a real emergency situation.

The final two questions measured how respondents felt about the VAS compared to other evacuating systems with which they were acquainted. Respondents answered that this drill was less confusing than others they had been in, and expressed a strong preference for a VAS over a usual bell signal for an emergency. This response was especially gratifying since participants who had received no orientation toward the system were just as enthusiastic about the new VAS as those who received prior orientation.

Comparison of Oriented and Non-oriented Respondents

As was indicated above, during the drill no major differences were noted between those who had received prior orientation (20–24) and those who were occupying the building without such orientation to the emergency systems (14–18). There were no differences concerning evacuation time and behavior reported by those observing the drill. A statistical test of analysis of variance was performed on the responses to all the questionnaire items that were placed on the 5-point continuum from strongly agree to strongly disagree. No question yielded a significant difference between the two compared groups ($Fs = < 1$). This result was most gratifying since it lends support to the conclusion that the vocal alarm system itself and not the orientation was responsible for the orderly and quick evacuation observed and recorded.

CONCLUSION

We began this paper by recognizing the fact that while there is no specific training that prepares experts to examine and facilitate positive behavior during emergency situations, there is an established body of research that gives them indications of the best way to evacuate personnel during emergencies. We attempted to review and apply such research findings to the construction and evaluation of the VAS for one high-rise building. From our evaluation it seems that the research findings were properly applied to make an effective evacuation system.

It would be a mistake to think that research on the problems discussed above should end with one demonstration of a working system. As was mentioned throughout the paper, the research utilized throughout this study was "borrowed" from various areas of psychology. This was done because of the lack of any direct research on problems associated with creating an effective VAS. Before we advance too far in the development of more sophisticated hardware for the delivery of messages to evacuate personnel, we must concurrently directly research the questions associated with the human response in emergency situations. It is time to stop borrowing research and start performing the necessary studies which will directly help answer the problems associated with vocal alarm systems.

The questions that need researching are easily enumerated: (1) Which words are best to use in emergencies, (2) What types of voices, (3) How explicit should instructions be, (4) Should recipients know that the messages are automated, (5) How best to instill calmness under emergency conditions, (6) What visual helps should be incorporated into a vocal evacuation system, and (7) How best to answer the problems associated with bilingual or deaf audiences. These questions are peripheral to the question of whether automated messages are better than live messages or no messages at all.

We hope that the above study is an example of how fire-safety experts and psychologists can co-operate in trying to construct an effective VAS. But more importantly, we hope that this study opens the door to continued cooperation between the two professions in developing substantiated answers to the many questions that surround human behavior during emergencies.

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A STAND-BY RESEARCH CAPACITY

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Since the fall of 1973, a group within the School of Journalism at Carleton University in Ottawa, Canada, has maintained a stand-by capacity to do research in the wake of crisis or disaster. This article is a review of that capacity – how it was developed and how it is maintained and operated.

The origins of the Carleton project date back 10 years, to 1966. It was then, from a chapter called, "Anticipatory Studies and Stand-by Research Capabilities" in a book called *Social Indicators* (Biderman, 1966) that the author of this article and some others became interested in stand-by research. It seemed that this idea – the idea of having a research group on tap at all times – had a particular relevance to those involved in journalism; for it is a matter of professional pride that journalists are always available for duty.

But it wasn't for several years (until 1970) that the Carleton project became less of an idea and more of a reality. That year – the year of Canada's October crisis – the idea of stand-by research was discussed in a fourth-year undergraduate seminar. Those in that seminar (two faculty and 12 students) agreed to operate as a stand-by research unit if an appropriate opportunity arose [1].

Actually the agreement was more specific than that. The seminar was particularly interested in interpersonal communications – in the flow of information from one person to another. And it was struck by the fact that a number of researchers, notably Elihu Katz, had stated it would be difficult if not impossible to trace the flow of information through all of its stages (Katz, 1957). What those in the seminar agreed was, given an appropriate opportunity, they would do an advanced form of diffusion research. The research team would select a sample, find out how those in the sample had learned a specific item of information, then, if interpersonal communication was involved, trace that flow of information from person-to-person back to its original source. The seminar group assumed that, in order to do this, it would have to be tracing a piece of rather dramatic information or news.

As things turned out, such a piece of dramatic information was not long in coming. The seminar took place on a Monday. On Thursday that same week (three days later) it was learned that a kidnapped British diplomat, James Cross, had been located alive and well in Montreal. The kidnapping of Cross had begun the Canadian crisis of 1970; it had been followed by the kidnapping and murder of Quebec cabinet minister, Pierre Laporte; and it had led to the stern war measures taken by the federal government. The finding of Cross, alive and well, was a singularly dramatic event.

Although the seminar group had agreed to operate as a stand-by research unit, it had not made any preparations to do so. The finding of Cross caught it unprepared. So, that same day, Thursday, the team put together and pre-tested

a brief questionnaire [2]. It sought out and found help in drawing a small sample. It located transportation and accommodation [3]. And it activated all but one of the 14 members of the group. Not only that, it achieved all of these goals so quickly, it was able to begin interviewing just after supper on Thursday evening.

(The actual Cross study was done in Kingston, Ontario, a community about 115 miles from Carleton's location, Ottawa. Kingston was selected not because it had any specific connection to the finding of Cross but because it was a medium-sized, relatively homogeneous community. Since diffusion of news was being studied – and not a specific crisis or disaster – any comparable community would have sufficed.)

The Cross study was relatively successful and it has been reported elsewhere (Scanlon, 1971). As important, however, as its findings were its implications for stand-by research. The seminar project had established it was possible at Carleton to activate a research project in a matter of hours given advance commitments by a number of researchers.

Two years later – autumn, 1972 – a number of academics at Carleton decided to try to follow up on this achievement. At a meeting called by the author of this article, five of them – Taylor and Scanlon and Dr. Stephen Richer (Sociology), Dr. Jack Graham (Mathematics) and Dr. John R. Weston (Journalism) – decided to seek funds to carry out further research into interpersonal communications [4]. As a result of some discussions with officials of the D.R.B., the Canadian Defence Research Board, the group further decided they would focus on the flow of interpersonal communication in time of crisis or disaster.

This latter decision is really not surprising. It had always been clear that tracing interpersonal communication made more sense when a dramatic, well-defined event was being dealt with. When it appeared D.R.B. might fund the project, the researchers were quite content to deal with dramatic events such as crises and/or disasters. The proposal for such crisis and/or disaster-related research, therefore, went to the D.R.B.

In the spring of 1973, the Carleton project, now known formally as ECRU, the Emergency Communications Research Unit, got a D.R.B. grant, its first non-university funding [5]. It then began the planning of the present organization, the organization which is described in the rest of this article.

Despite the passage of time and despite the expanded experience, the present ECRU *field* operation is a great deal like the original Carleton stand-by research unit. It still consists of two faculty (the same two) and it still consists of undergraduate university students. It is still mainly interested in the flow of interpersonal communications – and the tracing of that communications system. And it is still using survey research as its main research tool.

But there have been some major changes. And most of these changes affect not the field operation, which has remained fairly standardized, but the advance preparations. The Carleton research unit (ECRU) is now very well prepared when it moves into the field.

The first critical development was the preparation of a questionnaire – one that would be appropriate under most crisis or disaster situations. Over the past two and one-half years, ECRU has developed, and tested, more than a dozen different versions of a questionnaire. It has now settled onto a fairly standard one, useful in almost all situations. The questionnaire has several component parts. One attempts to fix the way the respondent learned about the event. A second tries to establish reaction to the news – emotional and physical. A third pins down the precise nature of the communication. A fourth covers socio-economic data. And a fifth tries to establish the respondent's normal communications patterns.

In a number of the areas mentioned there have been refinements over the years as a result of field experience. People who learn first

from media are now asked, for example, whether they heard a news broadcast or a special bulletin, and whether they were listening closely or just happened to catch the information or if someone called their attention to the broadcast. People who learned from someone else are asked to categorize that someone else in a very precise way – and many of these categories such as "know them to see them" have been developed by ECRU. And people are pinned down about the nature of an interpersonal communication with such questions as "was that person talking directly to you or did you overhear as part of a group?"

What all this means is that with one or two exceptions a complete questionnaire with detailed code categories, can be run off in a matter of hours. The only changes necessary relate to warning systems (the questions are slightly different if there was a warning) to the precise definition of the event and to listing of media outlets in the area being covered (to save coding problems). It took only three or four hours to run off 200 questionnaires for the last study.

The critical element here is, of course, that ECRU's goals are defined and, therefore, its instrument is well-defined. ECRU research takes advantage of an unexpected event; but its approach to studying that event is not ad hoc.

The selection and maintenance of the research team has been standardized in the same way. The team now normally consists of two faculty and 15 undergraduate students. The faculty are regular team members. The 15 students are volunteers and are selected at two regular recruiting sessions held each year at the School of Journalism. At any given time, the team's membership has certain characteristics [6]. At least half to two-thirds have had previous field experience. Approximately half are male, half female. Approximately one-third come from each of the second, third and fourth years in Journalism at Carleton. Approximately 40 percent are aged 21 or more and can drive (this is a necessity because of insurance restrictions on rented cars). Roughly half are bilingual French-English. And a number of others can speak additional languages, normally Italian, German, Ukrainian. In addition, all have signed a legal release absolving Carleton (and ECRU) from liability and have available identification including both an ECRU ID and a specific government ID issued by the Federal crisis agency, Emergency Planning Canada. Finally, as of this year, almost all team members are among the top students in their year.

This balance of experience and capacity has been achieved by a very careful selection process. Each year at the two recruiting sessions, available talent is carefully screened: the choice of team membership is then made according to the above targets. This selection process is possible, of course, only because team membership has become a high status function at the School of Journalism. As a result of this, there is usually a far larger turnout of volunteers than is necessary for field operations.

Undergraduate students have, obviously, other commitments than crisis research. This has been taken into account in developing the ECRU system. What happens is this: each term (Canadian universities operate mainly on a two-term system, one in the fall, one in the spring, with summer off) at the recruiting session, team members discuss their availability. Normally, it is agreed that those selected will make themselves available from late September (after the first week of fall classes) until late November (about one week before Christmas exams), again during the Christmas holidays (except for Christmas day itself) and finally from the second week in January (after the first week of spring term classes) until late March (10 days before final exams). It is also agreed that once a team is activated during a term, it will then stand down for the rest of that term.

All team members (who, incidentally, are unpaid volunteers) agree to be available for those periods once selected. ECRU agrees to draw

any field research group from the posted list of those selected until a new recruiting session is held (the sessions are held in September and January).

In order to make this stand-by situation meaningful, ECRU insists: volunteers attend a number of simulations (though never in conflict with classes); volunteers notify all faculty of their situation and clear, in advance, arrangements to make up any missed course work; and volunteers list with ECRU a complete personal inventory of how they spend their time.

This last inventory (which is used only to locate personnel in time of crisis) covers all personal habits: It has proved to be incredibly efficient: no team member has ever not been located; some team members have been located very quickly in places hundreds of miles from Ottawa.

This covers the questionnaire and the team. But ECRU's arrangements do not stop there. In addition to planning at home, ECRU has planned abroad. The two ECRU field research faculty have travelled coast to coast in Canada briefing municipal officials, police and emergency personnel about ECRU and its operation. These officials have promised assistance in time of crisis [7]. Furthermore, with the assistance of Emergency Planning Canada, ECRU has a standing arrangement with Air Canada: ECRU personnel can get priority service when moving into or out of a crisis area.

Finally, ECRU appears to have resolved one critical aspect of speedy survey research – the high-speed selection of a sample. A graduating student, Rodney Borm, under the supervision of Dr. Graham, has completed a thesis dealing with this problem, "Sampling Techniques with Application in the Field of Emergency Communications Research" (Borm, 1975). The Borm system is now available for use by ECRU during crisis activation.

This system does not, of course, run by itself. It requires secretarial help (for maintaining contacts by letter) and for typing and preparing questionnaires. It requires administrative assistance for maintaining contact with airlines and holding files on team members. It requires time for recruiting sessions, for simulations and for visits to potential disaster communities. The ECRU operation is still run almost entirely on a volunteer basis. The two faculty are not paid. The students are not paid. Most of the secretarial help (which is provided by the School of Journalism) is not paid by ECRU. Only the administrative assistance (provided by a part-time student) and some secretarial help (provided by a part-time secretary) costs the project money. But, despite this, ECRU does require funding and that funding has come almost entirely from two sources – the Defence Research Board and the Federal crisis agency, Emergency Planning Canada.

This, therefore, is the system. How is it activated?

When a crisis or disaster occurs, ECRU usually hears about it first from the news media. The team originally had tried to develop contacts in specific communities but this did not work and, in any case, it was not found necessary. Any event significant enough to study will be given major media coverage.

Once this word is received – word that an event of some importance has taken place – a number of things begin to happen:

1. One of the two faculty involved consults with Emergency Planning Canada, and a decision to go or not go is made on the basis of available information;
2. Someone (usually the administrative assistant) notifies team members of the possibility of a field trip;
3. The senior team staff (usually the two faculty) decide which personnel will move first;
4. One senior team member (usually one of the faculty) calls secretarial help and begins the process of running off questionnaires;
5. One senior team member (usually one of the experienced fourth-year students) talks to persons in the affected community; and

6. One person (usually the administrative assistant) begins drawing the sample.

Since all of those involved in this process are experienced personnel, and since these tasks are well known, all of these functions usually go fairly smoothly.

As this is going on, team personnel are also deciding – if the decision is to move – just how to reach the affected community. (The team has used private automobiles, bus, train, rented cars, plane and even boats in its various field trips.) Once this decision is made, one team member begins the process of making travel arrangements.

All of this may sound complicated but it is not – and it is not complicated because of a number of other factors: all team members have been thoroughly briefed as to just what happens – they even are provided with a list of what to carry: most team members have had previous field experience which means they are carrying out a routine; all team members are in journalism – and are used to the idea of a quick response; all team members have made arrangements with others or at least have notified others of what might happen; and all team members have been given (and have read) a manual which spells out precisely what happens during a mobilization (Scanlon, 1975).

The manual is available for those who may wish to read it.

In the field, the same sort of planned routine is followed. First, an advance team moves in ahead of the main operation. This group, some experienced, some inexperienced personnel, makes contacts with local emergency officials, makes accommodation arrangements, arranges for car rentals, and so forth. Then, as the main group arrives, the survey begins: experienced and inexperienced personnel are matched, so new personnel can be both trained and monitored. On a daily basis, team meetings are held, and problems are discussed in a group situation. (These meetings are considered especially important to ECRU. They allow a constant checking on all work – and on all problems. And they guarantee that all team members get an insight into all parts of the operation. They are probably the place at which the major learning process takes place – and thus, the reason why students are anxious to volunteer for the project.)

Perhaps, at this point, it would be useful to note that the existence of inexperienced and experienced personnel – and the ratio of each – is deliberate. It is assumed by ECRU that in any operation there will be some turnover – people will move, retire, become ill, etc. In a student operation, this will be especially true. So ECRU, to avoid unplanned turnover, deliberately rotates about one-third of its personnel each field trip. This guarantees a constant injection of new personnel and assures a steady supply of trained people [8].

In the field, there is also a systematic approach to research. All questionnaires are kept in numbered files and and record is kept, at all times, of the location of each file. Each night, each file must be turned in. In addition, ECRU uses a system of color coding, a quick glance indicates the situation regarding each file. This is especially necessary in the ECRU project which involves tracing: one sample point can lead to as many as nine additional interviews – it is never possible to tell until the original source is located how many interviews may be necessary to complete a file.

One further requirement is that every person handling a file is required to note, in order and in detail, what he or she did with it. Thus anyone picking up a file can read its history. Furthermore, at the regular team meetings, any problems are discussed and the status of every incompleted file is reviewed. (This often leads to sharing of information – something increasingly important as the various interpersonal communication chains start to interconnect.)

Another aspect of the ECRU field operation is the designation of specific responsibilities to individuals. One person acts as treasurer and handles all finances. Another looks after the file

room and, when coding begins, after the coding operation. Still another looks after car rentals and travel arrangements. Each day, at team meetings, each of these people look after any problems in their area of responsibility.

As an operation in the field approaches its end, the same people take over the job of clearing up. The file person must check out each team member before departure: no one is allowed to leave without having completed his or her coding. The treasurer clears each person's finances. The travel and car officer checks out accommodation, makes travel arrangements and returns rented equipment.

Once again, all of these activities follow a specific laid out plan – and, once again, this plan has been spelled out in detail, in the ECRU manual.

Once the team is back in Ottawa, the situation is again a fairly standardized one. The material gathered in the field is turned over to the research staff for processing and analysis [9]. Those contacted in the field are thanked for their assistance. A review of team personnel takes place. The questionnaire is revised to take into account the new field experience. And a new recruiting session yields a revised field team ready for another field experience.

The whole procedure has gradually worked itself into a smooth, consistent operation. As this is being written, for example, the team has just finished a field operation. It is now down (not on stand-by) for another 10 days. There is a new recruiting session already scheduled. A team review has taken place. Letters of thanks have been written. A first report on the latest project has been made. And a questionnaire revision is under way. In 10 days time the field team will be ready to move once again if events so dictate.

A quick rundown of the present situation is probably the easiest way to illustrate the way the ECRU stand-by process works. At present, ECRU has available 16 students with field experience ranging from one, who has been on every ECRU trip, to five students in their second year, all of whom had their first field experience this fall. This group of experienced personnel includes seven males and nine females and includes six students from the fourth year, five from the third year and five from the second year. It includes students who speak French, Italian, German, Ukrainian and Russian. And it includes seven over 21 with licenses (who can therefore drive rented cars).

When the team is re-activated, about eight of these experienced persons will be put on stand-by. The rest will be held on a reserve list. This will mean that if, for any reason, an experienced person withdraws, it will be possible to replace them with another experienced person. Thus, by constant rotation – and by maintenance of experienced personnel on a reserve list – the balance of experienced personnel is maintained.

All this probably makes it sound as if ECRU is always a beautifully-tuned operation. Most of the time that has, in fact, been relatively true. But there have been some problems: on one occasion, the team lost approximately 13 questionnaires – questionnaires that had been completed (a situation that led to the present checking system); twice the team has had automobile problems – minor accidents have caused rows with rental agencies; once the team left behind its questionnaire cover sheets – an error that took 48 hours to rectify because the team was in an isolated community; once the selection process has generated inadequate field personnel – personnel who later had to be replaced; and once – and once only – a team member on stand-by declined to respond to an alert.

On the whole, however, the ECRU system has functioned well. So far, it has been activated six times. Each time it has responded quickly and quite efficiently. It has moved into action in as fast as 24 hours (on the ground in the affected community). It has dealt with events as diverse as a shoot-out, a snowstorm, a windstorm, a building explosion and a mudslide. And it has worked in communities as far apart as St. John's, Newfoundland, and Port

Alice, British Columbia – communities approximately 5,000 road miles apart – as far east and as far west in Canada as it is possible to go from ECRU's home base at Carleton University in Ottawa.

NOTES

1 Although the students have all since moved on, the two faculty members involved in that seminar, Brian Taylor and Joseph Scanlon, are the ones still most active in the current project.
2 One of those who provided impromptu help for this project was a sociologist, Dr. Stephen Richer. He became a founder of the current operation.
3 The project received a great deal of support from the Kingston daily newspaper, the Whig-Standard.
4 Dr. Richer and Dr. Graham are no longer associated with the ECRU project.
5 The initial Cross project, which cost well under $ 500, was funded from the School of Journalism departmental funds, normally available to a fourth year seminar.
6 The reasons for these characteristics are spelled out in the team manual. See Scanlon, 1975.
7 These promises have always been kept. ECRU, in turn, systematically makes its findings available to such officials.
8 This concept of planned rotation (conceived by Mr. Taylor) also guarantees that fresh ideas will be constantly injected into discussions in the field.
9 There has been no attempt to describe the analysis here. It is the usual slow laborious process. Work on the first field study, done in 1973, still continues.

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CURRENT THINKING ABOUT CRISIS OR PSYCHOLOGICAL INTERVENTION IN UNITED STATES DISASTERS

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This article discusses current thinking about psychological or crisis intervention in post-disaster situations in American society. It is less a report of research findings than a setting forth of general assumptions being made and response procedures being advocated. Furthermore, the article reflects what the author personally perceives as the stance being taken by federal agencies and mental health practitioners in the United States with respect to the mentioned intervention. Thus, the views expressed do not necessarily represent the official policies or formal position of the National Institute of Mental Health or the United States Department of Health, Education and Welfare, the two government agencies most heavily involved in present day crisis intervention.

Mental health crises have existed since time immemorial and continue to express themselves the world over. On occasion, the news media will highlight various mental health crises because of the dramatic qualities which attend some of these situations. Principally, these are catastrophic and natural disasters, wars, and suicidal behavior. While such crises are not new to mental health, it has been largely within the last few decades that a useful body of knowledge has been assembled for teaching purposes in professional and graduate schools.

The term "crisis" may be differentiated from "emergency" in the mental health field, as in the realm of physical health, as the author has noted (1976). Any situation which affects the emotional or mental equilibrium of the individual to the extent that intervention should be supplied in order to preclude possible damaging physical or psychological sequelae, constitutes a *crisis*. It may differ over time and vary from minutes to months. The crisis may enlarge or diminish and may develop into an emergency, which necessitates immediate attention. *Crisis* refers to a time interval in a sequence of events; whereas, *emergency* suggests a need for present action. In the extreme, one dimension of crisis is marked by self-destructive behavior, with a fulminating quality which requires acting with dispatch.

An emergency in mental health suggests an urgent, sudden and pressing need, somewhat analogous to an emergency in physical medicine. The etymological base of the word points to a raising-up or heightening of a condition or situation. A quick change is implied, wherein the symptoms are intensified. Any emotional or mental disturbance requiring prompt attention in order to prevent loss of life or injurious physical and psychological effects constitutes a mental health emergency. As to duration, an emergency is arbitrarily often defined as constituting a few hours or less than a working day at most.

With regard to treatment in the mental health realm, any therapeutic procedure which utilizes relevant techniques in order to ameliorate the mental and emotional stresses related to crisis may be considered *crisis*

counseling or *intervention*. By definition, a short-term and time-limited method is utilized. Any long-term procedure does not characterize crisis counseling, although it may be a suitable follow-up procedure in its own right.

EXEMPLARY INSTANCES OF DISASTER REACTIONS

The personal loss and special stress associated with disasters have been neglected as factors contributing to self-destructive behavior, until recently. Reports from both North America and Latin America have pointed to direct and indirect phenomena surrounding disasters which invoke an increase in suicidal behavior. It should be noted that statistics can be inflated markedly in short order as a result of such events. For example, following Hurricane Fifi, in Honduras, where roughly five thousand people were killed and thousands more left homeless, it was reported that some twenty persons committed suicide almost overnight upon hearing that they must leave their homes never to return due to resettlement elsewhere. The deep-rooted ties to home were undoubtedly bound to the ego structures of these victims. The problem of mobility is also likely to affect persons differentially at different age levels. Children of army personnel are frequently called upon to move, but usually suffer less psychic trauma than our unfortunate friends in Honduras, due to family unity and learned expectancies. The stress of destruction, followed by relocation and rehabilitation, may take a severe toll and require much more careful evaluation. Would persons in Beverly Hills, California; Battle Creek, Michigan; or Dallas, Texas; have responded in a manner similar to the victims in Honduras? The plain fact is that we simply do not know. Personally, this author doubts it. Nevertheless, the phenomenon needs to be studied in order to train and treat the inhabitants of communities throughout the world. Depressive reactions and suicidal behavior have been reported in association with a number of disasters but the reasons for the occurrence of each are not yet clear.

When a dam broke in Buffalo Creek, West Virginia, in 1972, killing one hundred and twenty-five persons and rendering thousands homeless, bodies were strewn for miles up and down the valley as a consequence. The sequelae resulted in unanticipated emotional and mental health problems, according to Titchener and Kapp (1976). They report the persistence of insomnia and phobias in apprehension of further destruction, particularly on rainy nights. Many community members displayed continued apathy, loss of interest in work and interpersonal relationships, a diminution of sexual relations, and a marked decline in general day-to-day efficiency, in contrast to their former level of functioning. Moreover, anger, resentment, and hostility was widespread more than two years after the disaster.

EXPECTED PHENOMENA

As noted by White and Haas (1975), much of the research on disasters has been sporadic, limited to the interest of a particular investigator focusing upon local problems and based upon narrow theory. They emphasize that no broad body of knowledge has emanated from such research and earlier findings have not been updated in terms of the social and economic changes occurring in the United States. The psychological effects of disaster on victims in a stricken community illustrates this point clearly. On the basis of a very small number of research reports, it was thought for years that any mental or emotional effects were minimal, at most. Recent disasters have shown that not to be the case. This misperception has been due largely to inadequate research, which has been much too parochial, in addition to the fact that skilled mental health clinicians have not been involved in disaster studies until recently. It was only after such disasters as the San Fernando earthquake

in 1971, Buffalo Creek, Rapid City, and Agnes floods in 1972, the Mississippi Valley floods of 1973, the storms and floods in Nome, Alaska in the winter of 1974–75, and the recent Grand Teton Dam flood in Idaho in spring of 1976, that the real necessity for crisis intervention and mental health counseling became obvious.

It has become increasingly apparent that at least three aspects of disaster behavior, heretofore thought to be predictable with good reliability, do not obtain in fact. First, when operating under the stress of a disaster, it was believed that people would over react in the ways one might expect in such a situation. In essence, they would probably become panicky and even go berserk under the pressure. People seldom get so panic stricken that they run amuk during a disaster, unless they are pinned into an enclosed area which is on fire. Although a number of behavioral disturbances are associated with disasters, including some which are dramatic, going berserk in not one of them. Secondly, shortly after the disaster impact, it was felt that solace could be taken in the fact that in time of disaster, our fellow-men would always behave in constructive ways. For example, cohesiveness and a mutually cooperative spirit would inevitably provide the bottom line upon which group behavior could be established. While there are instances where some persons behave, at least temporarily, by giving of themselves unstintingly to assist their fellow humans in distress, it is far from being foreordained. It is not uncommon for persons under such conditions to become hostile towards friends and family, resentful of neighbors who have been spared personal heartache, and angry and suspicious of helping personnel. This phenomenon of open resentment usually shows itself later, after initial shock and helping responses have occurred. Neither heroism, nor hostility, are destined reactions, however. (Titchener and Kapp, 1975; Drabek and Stephenson, 1971; Dynes and Quarantelli, 1974). Thirdly, professionals must realize that years of experience taken from psychotherapy may not provide them with very helpful methods to employ in order to assist persons with the mental health problems associated with disaster. Classical psychotherapy procedures not only may be ineffective, but they are often inappropriate and even deleterious to crisis intervention efforts. Reflective techniques, and lack of direction and guidance, can add to frustration and promote further mental stress. (Hart, 1974; Robinson and Campbell, 1976).

CRISIS INTERVENTION FOR CRISIS WORKERS

Personal contact by the author with officials and crisis workers in such recent disasters as the Grand Teton Dam flood, in Idaho, and the Big Thompson Canyon flood, in Colorado, have highlighted the need for support of the mental health crisis workers themselves. Under such pressure, physical exhaustion inevitably takes its toll, along with the added ingredients of emotional stress and trauma. It often becomes necessary for workers to wear many hats, so to speak, by engaging in numerous activities which transcend the specific areas of expertise and training for which they have been oriented. The sources of stress may vary from assisting with the removal and identification of dead bodies, to the effective handling of persons with depression and paranoid symptoms stemming from loss of personal belongings, property, loved ones, or friends. Doubts begin to emerge about whether or not situations have been handled in the most effective manner.

Not only do mental health crisis workers, including the professionals, need support and case consultation on an ongoing basis, but they also frequently require some respite or retreat from their duties for a given period of time before returning to work. Scheduling a break from crisis activities with suitable back up forces, should be part of the planned program. These periods away from the activities involved need not be lengthy, since a few hours, or a single day, will often suffice. However, prior ar-

rangements should allow for continuing sensitivity to the worker's needs so that longer periods, or more specific intervention to assist the worker, can be supplied when necessary. It is no favor, either to victims or crisis workers, to foster therapeutic encounters when suitable services cannot be provided. To the extent possible, it is helpful to screen workers ahead of time, so that those who may not be as adaptable as others to any given situation may be eliminated or assigned to other duties.

It is useful to provide the worker with a clear understanding of what may be expected, so that personal recognition of one's own limitations and shortcomings can be placed in proper perspective. It should be emphasized that every human being has his, or her, limit and it is appropriate and healthy to recognize this fact when the time comes. Heroic actions must be realistic. The mental health crisis worker would be ill-advised to expect himself, or herself, to act in superhuman ways in expenditure of energy of any dimension; physically, emotionally, or mentally. Recognition of these facts is an absolute necessity to prevent becoming a self imposed victim of the so-called "burn out" phenomenon. These components should be openly discussed, together with all other facets of the crisis intervention program.

DIFFERENCES BETWEEN CRISES IN WAR AND NATURAL DISASTERS

At least one reason why many persons believe that cohesiveness occurs following disasters, stems from past efforts displayed during time of war. Wars which are regarded as justified by a majority of the population bring coalescence. In contradistinction to war, people affected by non-military disasters do not always mobilize community resources into a unified whole, working in concert toward a common cause. Some of the differences which serve to contrast war efforts with mental health problems often seen in disasters are these:

(1) War is an ongoing process, operating continuously. Specific activities and jobs are targeted toward a war effort, all emphasizing long-term, meaningful production.

(2) A nation's spirit has been insulted or challenged by war; a fact which does not obtain in disasters. There is little national interest to motivate persons affected by disasters. Only a temporary call for cooperation obtains. Since the victims of a disaster realize that the event has already occurred, emphasis is placed mainly upon mopping-up operations. Rebuilding focuses around individual motivation, rather than group responsibility. In war, some great injustice or misdeed has taken place which must be undone. By contrast, disasters are fateful events over which man has little or no control. It may appear as if the community and its inhabitants are victims of fate, which man has little or no control. It may appear as if the community and its inhabitants are victims of fate, which merely adds to the feeling of frustration and utter despair.

(3) The tooling-up period present in war seldom accompanies disaster efforts. The nation's resources in all sectors, private and government alike, assist in a period of war mobilization and preparation. Equipment and supplies are also made available to other countries assisting in the war program. Being of shorter time span, disasters permit no such preparation. Unlike war, there is little or no entertainment or glamour to appeal to persons who are disaster victims.

(4) War does not occur precipitously, as a rule, while disasters do. There is no time to fight back in disaster. Disasters occur like the hit-and-run driver of an automobile. There are feelings of frustration and powerlessness. When one is given time to muster courage to fight back, a rehabilitation effort will follow. However, when there is nothing present to fight, there is little for the ego to use in the process of reorganization and reconstruction.

(5) Although various mental disturbances develop from the stresses of both wars and disasters, suicides decrease during the former,

but are not unusual during and after the latter. People feel there is something to live for in wartime, but this motivation is more likely to be absent when associated with disasters.

A particularly important variable in the psychological response to disaster appears to be the time factor, although this requires further documentation and research. Disasters occurring over a period of several days or weeks, such as floods and hurricanes, seem to take a greater toll psychologically than those which happen rapidly, because recovery measures can begin much more quickly in the latter instance.

POST-DISASTER ACTIVITIES

Once a disaster occurs, the immediate, acute problems need to be managed and plans for handling them must be put into action. Both Federal and local administrators should know when and how to expedite their forces. Thus, a focused disaster activity can be integrated at the Federal, State and local levels. Various professional disciplines ought to be mobilized to carry out their assignments in the most effective manner possible. Non-professional workers who are trained and supervised, can be brought into action from the beginning. It is important to take account of where people are likely to congregate, so that most of the activities can be concentrated in that area. A continuing follow-up activity is necessary, even after the acute phase has passed.

PRE-DISASTER TRAINING

Some health unit or clinic in every community should have a mental health team geared to respond to the crisis occurring with disasters. It is necessary to plan ahead and train a cadre of workers to be available to handle problems stemming from natural disasters prior to their occurrence. To give a homely analogy, the most efficacious way to train a surgeon would scarcely be to wait for a ruptured appendix to appear before having the neophyte surgeon begin his practicum work. Hence, both pre- and post-disaster training are of the utmost importance. There is a need to develop various kinds of preparedness programs in the realm of mental health activities. Educational projects for children and adults should be part of this activity. Fire drills have long been a standard part of preparedness activities, but there is no reason why psychological first aid and crisis intervention services cannot be an integral part of the total preparedness training effort. Some of these require the assignment of specific tasks in the home by all family members, in keeping with their capabilities. Instilling a sense of responsibility is the nucleus of good mental health for persons of all ages. It is the essential ingredient in the prevention of mental problems, including suicidal acts and depression.

SPECIFIC PROBLEMS AFFECTING CHILDREN

Although a variety of emotional and mental health disturbances in children have been reported following disasters, the most prominent seem to be phobias concerning the natural elements and future disasters, sleep disturbances, and a lack of personal responsibility. These disorders have been in contrast to behavior shown before the disaster, and have been reported in various types of natural disasters. For example, the tornado in Xenia, Ohio, and the earthquake in San Fernando, California, as well as the Buffalo Creek flood disaster, all produced sleep disturbances, fears, loss of interest in school, and less responsibility among children. The persistence of these problems was unexpected, particularly prolonged sleep disturbances. It had been thought previously that such disturbances would abate following the disaster, but instead, they have remained for one to two years, or more. In addition, these problems have been reported in a large segment of the youngsters in the stricken communities, rather than in a small number of children. At least three-quarters of the youngsters in the affected areas have been subject to these disturbances.

SPECIFIC PROBLEMS AFFECTING ADULTS

Frequent symptoms appearing among adults include initial anxiety, often followed by anger, hostility, and resentment. Subsequently, depression and loss of ambition are not unusual. As noted previously, the commonly expected reactions of panic, followed by cohesiveness, understanding, and mutual assistance, do not always manifest themselves in the manner one might hope for. Marital discord tends to increase. This includes difficulties in the management of money, caring for children, and responsibility for housework, as a point of contention for change after a disaster. From a variety of disasters, we know that not only do problems of mental depression and sleep disturbances, including nightmares, increase following disasters, but disorders of a psycho-physiological nature affecting physical health may become apparent as well. There is a frequent increase in alcohol consumption and the use of tranquilizing agents for traumatic neuroses and anxiety, as well as in medications required for the management of such problems as stomach ulcers, headaches, and hypertension. Many of these disturbances resemble psychological equivalents of self-destructive behavior, when they persist over time. This is especially true if the individuals involved continue to neglect caring for themselves to heighten the difficulties which they have acquired.

THE DISASTROUSNESS OF DISASTERS

It is apparent from a statistical point of view, as well as a clinical one, that relatively small increases in aberrant behavior can sometimes inflate actuarial information to a marked degree. The pervasive aspects of publicizing negative behavior should be carefully considered. To dramatically illustrate the point, in a community of fifty thousand persons, if there were three more suicides than in standard year, that would constitute a starling increase in rate. The national average in the United States has hovered around one per ten-thousand population, for several decades. In the last few years, there has been an increase of about thirty percent in the United States, from ten to thirteen per one-hundred-thousand population yearly. In a city of fifty-thousand, this same rise of three, from five to eight per annum, would be an increase of sixty percent. It is not yet known to what extent part of the increase observed in recent times has been a function of natural disasters. Undoubtedly, some of it has been related to the economic depression, to which disasters simply add insult to injury, so to speak. The point is that when a community is affected by any phenomenon which produces physical and health problems, the insidious nature of the situation appears truly disastrous. Thus, a quick and dramatic increase in suicide rates for both attempted and completed acts can result because of the small number of cases which contribute to the computations. This does not minimize the problem, but it can alert those involved to the complexities of health issues.

THE FEDERAL ROLE IN THE MENTAL HEALTH ASPECTS OF DISASTER ASSISTANCE

Recognizing that disasters may be of catastrophic proportions, the United States Congress has taken the position that the problems ensuing therefrom are often greater than the ordinary citizen should normally be expected to bear alone. With this thought in mind, Public Law 93-288, the Disaster Relief Act of 1974, was created. Section 413 of this Act authorizes the National Institute of Mental Health to provide crisis counseling and training, including financial assistance, to State or local agencies, or private mental health organizations, for the victims of major disasters, in order to relieve mental health problems caused or aggravated by such disasters or their aftermath. This program has been developed in cooperation with the Federal Disaster Assistance Administration, which provides funds for its support.

For the purposes of this Act, a major disaster is defined as any hurricane, tornado, storm, flood, high-water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, snow storm, drought, fire, explosion, or other catastrophe in any part of the continental United States, or its territories, which causes damage of sufficient severity and magnitude to warrant major disaster assistance. After the official declaration by the President, this program may provide supplemental support for 180 days, with further authorization available when justified on an individual basis beyond that period. When existing facilities in the State are not capable of meeting communities needs, a proposal for support may be submitted through the State Coordinating Officer to the National Institute of Mental Health and the Federal Disaster Assistance Administration. The following baseline information is necessary to evaluate the proposal: (1) a description of the geographic area to be served; (b) an estimate of the number of victims requiring counseling; (c) the kinds of emotional and mental health problems likely to be encountered; (d) the local/State mental health resources available for use; (e) an estimate of the length of time for which mental health services will be required; and (f) a budgetary estimate of the itemized expenses necessary to render the service. A Government team coordinated through the Mental Health Disaster Assistance Section at the National Institute of Mental Health evaluates the proposal and makes the decision with regard to funding. If warranted, money may be made available very quickly to meet the immediate mental health needs of the citizens in the disaster area.

RECOMMENDATIONS FOR ALLEVIATION

Out of the numerous disasters which have been studied, both from a clinical and rudimentary experimental point of view in the last few years, it has become apparent that at least five points can be made. They are:

(1) Crisis intervention is usually helpful and is clearly superior to no intervention in time of disaster;

(2) The type of intervention must depart from standard psychotherapy procedures. The techniques utilized must be innovative and be suitable to the needs of the community, at the moment;

(3) An outreach program, rather than one which functions in a particular location, is likely to be particularly beneficial in time of disaster. One-stop centers, which can serve as a referral and way-station, can be an integral part of such an effort;

(4) Wide usage of traditional mental health terms should be avoided. Casting a crisis intervention effort in that mold will not be effective and can even be harmful in delaying the delivery of services to needy persons. People in disasters, who are in need of crisis intervention, do not see themselves as mentally ill and, in point of fact, usually are not. The use of such a nosology is rarely helpful; and

(5) To the extent possible, careful records should be kept, information documented, and research carried out, in conjunction with helping services, so that one can profit from the experience. All too frequently, even professional persons will rue, in retrospect, the fact that they did not make arrangements to collect certain kinds of data which could have been obtained easily, and which could stand in a good stead for projections for future training and service delivery to needed populations.

Being aware of many of the problems which accompany disasters, as well as the proper utilization of crisis intervention techniques, can augur well for developing programs to meet society's needs in the future in very practical ways. Such efforts would be in contradistinction to some of the less effective, post-hoc methods which have been applied in the past.

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A REVIEW ESSAY ON DENNIS S. MILETI, THOMAS E. DRABEK and J. EUGENE HAAS, *HUMAN SYSTEMS IN EXTREME ENVIRONMENTS: A SOCIOLOGICAL PERSPECTIVE* (Boulder, Colorado: Institute of Behavioral Science, University of Colorado, 1975), 165 pages.

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From the top it must be noted that anyone interested in the study of human behavior in disaster and crisis settings should examine this monograph. It is an important work. It offers to do for the field of disaster research what Berelson and Steiner (1964) tried to do for all of human behavior, i.e., present an inventory of findings which represent the accumulated body of knowledge of the discipline. Furthermore, the authors evaluate the adequacy of this knowledge base. Any manuscript that even attempts such a quixotic endeavor deserves a place on the shelf beside, but certainly not instead of, Barton (1963, 1969) and Dynes (1974).

Alright, the book is important, but does it succeed? In limited ways, yes. In other significant ways, no; it presents some problems. Before undertaking a detailed evaluation of the work, however, a brief chapter overview will be presented for those readers who have yet to examine the volume.

The purpose of the book is to answer the question, "What is known about human adaptation and response to natural hazards and disasters?" To attempt this herculean task the authors have reviewed 198 published works in the behavioral science literature concerning natural disaster response and preparation. Chronologically, the review covers studies published from 1920 (beginning with Price's classic analysis of the Halifax explosion) until July 1, 1973.

The literature review was broad in scope in that findings were collected pertaining to the entire range of disaster activities and system levels, from individuals to inter-societal comparisons. Furthermore, all of the works had to be empirically oriented, though not limited solely to sociology. Material from economics, political science, psychology, and anthropology was included also.

The scope of the literature review was narrowed along three dimensions. First, the review only included studies of geophysical hazards and disasters. Actually, the authors appear to have considered only studies of "accidental" or "natural" events. For example, "man-made disasters" were included only where these appeared to be the result of accident, rather than intent (p. 4). Second, only published works and doctoral dissertations were surveyed. The authors argued that these materials represent the evaluations of persons other than just the author, i.e., they have been "refereed" in varying degrees. Therefore, they claimed to have reviewed the "cream" of the disaster literature (p. 3). All in-house publications and un-

Editor's Note: The authors of the monograph declined an offer to respond to a pre-publication copy of the review.

published papers were excluded. Third, the findings had to be empirically based, irrespective of methodology. Purely descriptive, speculative and chronological documents were excluded. Of the material reviewed, the authors have estimated that more than 95 percent of the findings were based upon data taken from a single set of events, and therefore, "there is simply no way of knowing the extent to which those findings can be generalized" (p. 9).

The findings were coded into a 36-cell "knowledge matrix" that developed from cross-tabulating the variables of system level and time. The six system levels included: individual, group, organization, community, society (nation), and international. The time dimensions utilized correspond to the typical pattern of disaster activity: preparedness/adjustment; warning; pre-impact early actions (mobilization); post-impact, short-term actions; relief or restoration; and reconstruction. Although the works of Barton (1969) and Dynes (1974) were not included, a total of 1,399 findings were classified (p. 13). This "knowledge matrix" purportedly is the basis for the literature reviewed in the subsequent chapters.

A quantitative indication of the strength of knowledge in various areas can be obtained by examining the matrix. With respect to system level, we find that 38 percent of the findings classified deal with individual behavior. For the remaining system levels, the following figures were calculated: community, 25 percent; organization, 17 percent; group, 13 percent; societal, 8 percent. We have practically no findings classified as pertaining to international disaster response. When considering timeframes, 38 percent of all findings concern the immediate post-impact period. Twenty-one percent deal with preparedness and adjustment. Findings relevant to the warning process include only 10 percent of the total. The reconstruction phase has been the most widely ignored area for research. Only seven percent of the findings were coded as relating to reconstruction.

On the basis of simply counting coded findings, therefore, it is evident that most research has focused upon the individual system level and the immediate post-impact period. In fact, 12 percent of all the coded findings deal with individual, post-impact short-term action. Furthermore, if we extend the examination slightly beyond that undertaken by the authors, we find that 63 percent of all the findings concern the individual level (irrespective of the time-phase) and/or immediate post-impact behavior (irrespective of the system level). Quantitatively, we know little about societal and international behavior in disaster settings, and very little about reconstruction.

This "knowledge matrix" is presented in the introductory chapter. This expository chapter should be examined closely. In addition to the matrix, major concepts, alternative classification schemes, and methodological techniques are discussed. For example, the authors pose a distinction between the concepts of hazard and disaster; the distinction rests basically upon the time dimension. "Hazard refers to a potential set of events . . . the character and magnitude of hazard may be altered by man's actions . . . (it refers to) how man and his works stand in relation to future extreme geophysical events" (p. 4). In order to narrow the range of literature to be reviewed, the authors have utilized the relatively focused definition of natural disaster offered by Fritz (1961: 655). The term is used to refer to "accidental or uncontrollable events concentrated in time and space, in which a society, or a relatively self-sufficient subdivision of a society, undergoes severe danger, and incurs such losses to its members and physical appurtenances that the social structure is disrupted and the fulfillment of all or some of the essential functions of the society is prevented" (p. 4). Furthermore, the chapter includes a brief, but rather solid, discussion of the concept of "collective stress." As might be expected given the authors' previous writings on organizational stress (1973), the potentialities and problems of the stress concept are adroitly addressed.

Finally, it must be noted that in the introductory chapter the authors inform us implicitly of their view of the importance of this monograph. They compare and contrast it with the two previous, classic attempts to systematically review the literature on nature disasters and collective stress, i.e., those of Barton (1963, 1969) and Dynes (1974). Unlike Barton, the authors have not attempted to "tease out new propositions" or reformulate the findings into integrated theoretical schemes (p. 8). They offer that no attempt has been made to alter levels of abstraction and produce new variables. Unlike Dynes, they have not drawn upon unpublished documents and field notes. Furthermore, they have not limited themselves solely to a discussion of only organizations and communities.

Chapters two through five present the substantive knowledge that has been collected by the authors on the various time periods of the disaster process. The second chapter is entitled "Anticipating Disaster" and concerns the precrisis state of social systems. The chapter is organized around various determinants of level of preparedness, however, the major thrust of the presentation is that we know little about these determinants (p. 33). Warning, pre-impact response and mobilization are the topics in chapter three, "Response to the Unlikely." Relying heavily upon causal modelling, variables related to the evaluation, dissemination, confirmation, and response to warnings are reviewed. Perhaps indicating the magnitude of findings concerning this phase of the disaster process, chapter four, "System Shock: Immediate Responses Following Impact," is the most extensive chapter in the monograph. Similarly, chapter five, "Restoration and Reconstruction: The Process and Pain of Recovery," is a rather broad review of the oft-ignored area of long-range recovery.

The final chapter presents a brief, concise critique of the disaster literature and a call for the integration of hazard and disaster research into the broader frameworks of sociological, economic, geographical, and psychological theory (p. 146). The author offers the hope that middle-range, abstract and interrelated generalizations may be developed. Furthermore, it is proposed that the concept of "system stress," focusing upon subsystems and varying stress levels, may provide a conceptual tool for such theory development. Throughout the discussion, however, there is a general condemnation of a continuance of what the authors perceive as the atheoretical investigation of disaster behavior.

A bibliography of 198 sources is included, and should prove to be valuable to students in the field. However, the value of the monograph could have been strengthened significantly by the inclusion of an index. The intent of the authors may have been to provide a significant heuristic contribution to the field by identifying theoretical and methodological weaknesses in the literature and offering suggestions for future research. The chief contribution of the monograph, however, appears to be as a reference source; an index for such a volume is a necessity.

Upon finishing the last page, my immediate reaction was similar to that I experienced after seeing the film version of *Catch-22* and waiting for the Comet Kohutek. I approached both of these phenomena with great expectations. I was terribly disappointed. Similarly, my expectations for this work were not met. Perhaps they were unjustly high. However, they were based upon the admiration I have for the authors. Mileti, Drabek, and Haas are three of the most prolific, competent, and respected students of disaster phenomenon. Of course, Mike Nichols is one of the finest film directors. Perhaps only the admirable can disappoint.

Earlier we noted that the book both succeeds and fails. How does a monograph simultaneously accomplish these ends? Before presenting a detailed critique, let us note that this work takes two direct routes. First, the authors actually attempted to answer the question, "What do we know about human

behavior in disaster?" (p. 144). The question is deceptively simple. A successful answer requires an extraordinary effort. Problems of simply determining the parameters of the discipline and developing an appropriate classificatory scheme for the information may prove to be difficult. In addition, separating the wheat from the chaff and bringing a degree of coherence to the divergent findings can be vexing. With respect to these problems, certain parts of this monograph succeed, others fall short. It might be argued that the task is so difficult that it precludes complete success. Let us call the effort a "near-miss."

Second, the book is extremely uneven. With respect to organization, writing style, and depth of treatment there are great qualitative differences that vary by chapter. The book begins slowly, reaches stylistic and analytic quality in chapters four and five, and then offers a brief, predictable conclusion. That primary authorship has been assigned to each chapter in the construction of the monograph is hardly surprising; that chapter authorship is noted in the text is interesting.

Let us examine the basis for the entire endeavor, i.e., the literature reviewed and the "knowledge matrix." While the interdisciplinary nature of the review is laudable, there are some problems in the material selected. First, allowing for the economies to be obtained in drawing tight parameters around the literature, the exclusion of studies on "man-made disasters" and other than "accidental" natural events is not well argued. No sociological or theoretical justification has been given for ignoring these related works. Given the authors' own perceived need to integrate disaster findings with information from other areas, this related literature could have been profitably examined. Certainly studies from the fields of collective behavior, environmental sociology, and macro-level conflict situations are relevant. Second, the authors state that they are only going to examine published works and doctoral dissertations. However, when one examines the bibliography it appears that certain items do not meet these criteria. In-house publications, such as reports from the University of Chicago and the National Academy of Sciences (excellent though they may be) are included. Furthermore, material from the oft-cited edition of the *American Behavioral Scientist* (1969) is not truly refereed. Basically, the criteria utilized have the effect of excluding the rather extensive material produced by the Disaster Research Center during the past twelve years. This omission is unfortunate. The center has produced the most continuous, extensive examination of organizational and community studies of disaster behavior we have in the literature. The center is certainly not ignored! Sixty-five of the 198 sources cited in the bibliography have been produced by individuals who have been associated with the center. However, the exclusion of center reports presents a distorted answer to the question, "What do we know about human response to disaster?"

With respect to the "knowledge matrix," as a classificatory scheme, it is excellent. The cross classification of system levels and time phases is valuable. Given the development of the field, it is hard to even conjure a better classification. However, how valid and reliable is the "knowledge matrix" as an indicator of the state of the art? Qualitatively, it has little to offer. No information concerning the validity, reliability, utility, or simple importance of the various findings is presented; they are all treated equally in the frequency distribution. Quantitatively, how valid is the matrix? It is hard to say. No information is given as to the specific methodology utilized. How is each system level defined? Are interorganizational relationships elements of the community or organizational levels? What is the international level? Was any attempt made to determine intercoder reliability? How were findings differentiated from simple pronouncements? What criteria were utilized in the selection of findings? Unfortunately, no information is given about these operational problems. Until such information is provided,

we must consider the "knowledge matrix" as at best a rough approximation of the quantitative nature of the findings of human response to disaster.

The most important contribution of the matrix, nonetheless, is to point to gaps in our knowledge. However, the matrix presents a static picture of the nature of the discipline. The authors note that most effort has been expended on the individual level and the immediate post-impact period. However, this represents a picture of what has been. If we extend the analysis slightly beyond that undertaken by the authors, we can obtain a glimpse of "where we are going."

If one selects arbitrarily 1965 and examines the findings cited in chapters four and five on post-impact behavior, a rather dramatic pattern emerges that indicates the current trends in research. Examination of the matrix reveals that 80 percent of the findings concerning individual post-impact behavior were published *prior* to 1965. Similarly, 69 percent of the group level findings were pre-1965 in origin. However, 71 percent of the findings at the organizational level and 76 percent at the societal level have been produced since 1965. (Interestingly, the community level splits exactly fifty/fifty.) Therefore, it appears as though the field of disaster research currently is in the process of at least quantitatively filling some of the voids in the literature noted by the authors.

The distinction posed in the first chapter between the concepts of hazard and disaster also presents some problems; problems which become evident in chapter two. As defined, "hazard" is a rather messy concept. It is not clear if it refers to an "objective," geophysical, potential threat, a possible future condition of a social system, or a cultural or social psychological orientation toward threatening agents. The argument presented by the authors on hazard mitigation is heavily physical and ecological in orientation inferring that it is some objective, natural, threatening condition (p. 4). However, it might be all of these, and subtypes should be explicated. Furthermore, the concept becomes even more vague when one considers the issue of labeling. Simply put, "who, on the bases of what criteria, defines a condition as hazardous?" Potential victims, geophysical experts, and shamans may all be candidates for the role. Also, if potential victims, for example, do not view a geophysical condition as "hazardous" and do not act to mitigate it, is it a hazard? These problems become evident in chapter two. The title is "Anticipating Disaster," but the author states that the focus will be upon preparedness and adjustments for coping with natural hazards (p. 14). Furthermore, discussing loss and social disruption caused by "creeping hazards" does not clarify the issue (p. 14).

Chapter two is the most disappointing chapter of the monograph. The findings discussed relate to such crisis management dimensions as level of preparedness, planning, prior disaster experience (which includes a critique of the concept of "disaster subculture"), hazard and/or disaster perception, adoption and effectiveness of adjustments, and technological and cultural factors. While the author explicitly claims to examine *all* of the available findings concerning these variables, the impact of the chapter is one of a sparse, disjointed, and diffused collection of odds and ends. Problems of organization, integration and writing style plague the effort; it is a hodge-podge of isolated findings. Additionally, the writing style and organization change abruptly, and rather mysteriously, on page 23.

Indicative of some of the difficulties, we can note that it is not clear at times if certain statements are quotes from other literature or generalizations developed by the author. On page 17 the statement, "A disaster in one locale stimulates for a time serious planning for post-impact response and vulnerability reduction in nearby communities with similar hazard problems," could either be a generalization based upon findings induced by the authors, or a quote from Kates (1970). Alas, it appears to

be the latter. On page 28 we read that "a large-scale disaster in one locale stimulates for a time the serious consideration of adoption of relevant adjustments in nearby similar hazard locales." This statement appears as another finding dealing with a different topic and is accorded to Kates. Furthermore, some of the "findings," such as, "With regard to prevention, the single most important fact lies in training and preparation," are presented as pronouncements, without elaboration (p. 20). In addition, we should never be left with a "finding" such as "During the flooding of 1953 in England, the country's governmental structure is said to have affected the organizational readiness of the community" (p. 23). That's all, folks! No additional information concerning the nature of the influence is provided.

Indicative of the disjointed nature of the chapter, when discussing "planning for post-impact response per se" it is claimed that only the following three observations were located: (1) "Timing is often a pivotal factor in disasters and is important to everyone; yet it is rarely an integral part of disaster planning . . . even the season of the year is significant" (Disaster Research Center, 1968: 11); (2) Predisaster planning in this country (U.S.A.) relies in general on local agencies" (Raker et al., 1956: 11); and (3) "Urban areas do not have the same kinship structures as do rural areas, and need more public shelters" (Moore et al., 1963: 127), (pp. 17–18). No discussion of these observations is given; this survey purports to be the sum of our knowledge about planning for post-impact response "per se."

The second chapter also devotes considerable attention to prior disaster experience as a determinant of level of preparedness. The lack of conceptual rigor found in the literature concerning this variable is justifiably noted. In addition, a concise, critical discussion of the concept of "disaster subculture" is presented. However, the section includes contradictory material and arguments. In discussing the functionality of subcultures, the author asks, "Would a researcher *be likely to find* that some part of a disaster subculture actually increases vulnerability or produces a lower level of overall preparedness than would otherwise be present? *We doubt it.*" (p. 18 emphasis added). However, in the next two pages findings are cited from Parr (1969) and McLuckie (1970) that directly refute this conclusion. Furthermore, substantiation for McLuckie's finding that prior disaster experience may provide false reference points that lessen the adequacy of response is provided by the author in a discussion of the Rapid City floods (p. 20). The apparent contradictions in this presentation require elaboration and clarification.

It is interesting to note that it is claimed that there are "relatively few" findings concerning this phase of the disaster process (p. 15). However, an examination of the "knowledge matrix" reveals that 21 percent of all the coded findings were classified as dealing with preparedness and adjustment; in fact, it ranks second to the immediate post-impact period in number of findings. Furthermore, over 290 findings were classified in this time frame, however, less than 130 are directly cited in chapter two. What happened to the additional 160 odd findings? Given the author's expressed intention to summarize *all* of the available findings, what is the basis of this apparent selectivity (p. 14)?

With the aforementioned change in organization and presentation, the chapter improves considerably. The discussion of hazard and disaster perception is good, however, the distinction between hazard perception and hazard knowledge could be clarified. Furthermore, the general directions for future research are interesting, particularly those concerning flood insurance and technological factors. The chapter clearly supports the author's claim that additional work is needed with respect to this time frame.

The third chapter focuses upon warning and pre-impact mobilization. The discussion of warning is yeomanly. This concise treatment

extends the author's other work on warning. (See Mileti, 1975: 11–22.) The discussion of warning and response as system processes is excellent. A model of a warning system is presented that insightfully combines both structural and processual components. Similarly, other sections, such as that dealing with individual and small group response and the issue of panic, are coherent, well-developed summaries.

With respect to the evaluation and dissemination of warning messages, a causal model is presented. The model includes nine independent or intervening variables that are related explicitly to the major dependent variable, warning, through eleven propositions. The major dependent variable appears to refer to the successful issuance of a warning message and is therefore the output of the evaluation and dissemination subsystem. This definition of warning, however, could be more clearly specified. The model does a serviceable job of integrating diverse findings (pp. 39–42). While one might hope that the contradictions evident in the one paragraph discussion of the relationship between past disaster experience and warning might be clarified (pp. 49–51), the discussion is solid.

When considering pre-impact response, another causal model is developed based upon findings from the literature. This model includes 25 independent or mediating variables and the major dependent variable, i.e., response to warnings (p. 51). From this labyrinth of direct and indirect relationships, the author concludes that the two major predetermining or mediating variables are warning confirmation and warning belief.

In presenting evidence to support this model, however, some discomforting traits are evident. First, there is a tendency to overgeneralize the singular findings. For example, a single finding from a study that families warned in a certain manner seek to confirm the message through other means, is generalized as follows: "it can be stated that warning source is related to warning confirmation" (p. 44). Likewise, a single finding that separated families upon receipt of an initial warning are more likely to seek confirmatory information than united families, is the only basis for the proposition that "primary group context is seen as related to warning confirmation" (p. 44). Also, a single empirical observation on Spanish-American families is the source of a generalization on ethnicity (p. 52). Other examples could be given, however let us summarily note that numerous, low-level empirical observations become transformed into high-level, abstract generalizations.

Second, and perhaps more disturbing, the author presents inherently contradictory findings on certain subjects and then, without offering justification, arbitrarily concludes and accepts as valid one of them. For example, race is proposed to be related to warning belief, even though only two findings are cited as being related to this issue, and one of these found no relationship. Similarly, with respect to the relationship between warning source and warning response, one cited finding observed no relationship between the variables, while the other found that persons warned by authorities were more likely to evacuate immediately. Nevertheless, the author concludes that warning source is related to warning response (p. 48). Communication mode and socioeconomic status are similarly treated. Some methodological, or perhaps theoretical, justification should be given for this arbitrary practice.

Given the orientation of the chapter, the concluding suggestions for future research should not be surprising. First, there is a call for exploratory study of the evaluation-dissemination subsystem. Second, it is proposed that multivariate models of warning response be developed and tested. However, by organizing the chapter around closed-system, causal models, the impact of the chapter is more one of "premature closure."

Chapters four and five can justifiably be discussed together. They are the finest chapters in

the monograph. Both are organized around the knowledge matrix in a clear fashion. They are well written. All of the findings are coded by system level and time phase. Furthermore, and most importantly, the findings are integrated coherently into a series of generalizations. These chapters are valuable summaries of post-impact behavior. I wish I had written them.

Particularly noteworthy in chapter four, "System Shock: Immediate Responses Following Impact," are discussions of panic, altruism, structuring and other individual response behaviors. While one may quarrel with isolated summary statements, such as that panic is likely to occur "when an individual sees his escape routes blocked" (p. 58) – the literature generally concludes that escape routes are still open, but closing, and escape must be made quickly – the overview is excellent. Similarly, the discussions of role conflict and emergent groups are laudatory, though the latter might have benefited by inclusion of the collective behavior literature. The discussion of organizations raises excellent points on the continued, limited utility of employing descriptive labels for organizations and the need to recognize the variability in response required by any single disaster agent (pp. 76–77). Finally, the summary of findings on the community is perhaps the finest I have encountered that maintains the integrity of the system level.

Throughout this chapter, and the following one on restoration and reconstruction, stimulating questions for future research are nicely integrated into the body of findings. Particularly noteworthy in the latter chapter is the discussion of "synthetic organization" (pp. 115–119). Furthermore, the treatment of reconstruction and long-range change processes can be profitably examined.

If the quality attained in these chapters had been found in the others, the monograph would have been very successful. It may be argued that the quality and quantity of our findings dealing with the post-impact period are superior to those of the other time frames and account for the quality of these chapters. However, organization, integration, and writing style also appear to be factors.

As previously noted, the final summary chapter offers a brief critique of the literature and calls for theoretical development. It is hard to argue with this plea; any discipline can always use new, productive theoretical statements. After completing this review, I am left with the notion that we do know a great deal about human behavior in disaster. The problem is one of integration and theoretical generalization. Perhaps, as the authors note, middle-range theories should be produced. The stress concept does have great potential as a theoretical device for integrating varied findings; but as of now it is little more than a concept. However, there is also another direction that must be pursued, specifically the integration of empirical findings and theoretical concepts from related fields. The authors call for the integration of findings across disciplines. However, even within sociology this development has not occurred to a significant extent. Why greater cross-pollination has not occurred with the areas of collective behavior and human ecology has been a mystery to me. Utilization of emerging theoretical ideas on organizational and structural response to social crisis situations and the ecological complex would appear to be fruitful.

However, the cry for theoretical development and integration has a "hollow-sound" coming at the end of this specific monograph. The authors have chosen to present us with an empirically based classification scheme, have offered not to develop new propositions, and have limited purposefully the literature to be reviewed so as to exclude findings in related theoretical areas. Perhaps in addition to the uneven nature of the work, this is its greatest failing. It is an empirical, quantitative catalog. The authors criticize the field for failing to do what they have chosen not to attempt.

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THE GUATEMALA EARTHQUAKE OF 4 FEBRUARY 1976: SOCIAL SCIENCE OBSERVATIONS AND RESEARCH SUGGESTIONS*

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INTRODUCTION

It is very difficult to say that any specific country is a "typical" member of that group of more than one hundred nations called "underdeveloped," that group including as it does such diversities as Chile and Saudi Arabia, Burma and Zaire. But in the sense that all such countries share Dudley Seers' definition of underdevelopment – acute poverty, unemployment, and inequality – Guatemala can be considered typical [1]. Thus, while our specific observations concern the Guatemalan earthquake disaster, we will attempt to make appropriate points about the whole problem of earthquakes/disasters in underdeveloped countries in general. The organization of this article reflects that double intent: an extended first section profiling the Guatemalan earthquake and a concluding second section which serves as both a summary and as a vehicle to explore the research implications of our Guatemalan observations.

*The present article is a revised version of a field report submitted by the authors to the Earthquake Engineering Research Institute (EERI) of Oakland, California after a one-week (February 21–28) reconnaissance visit to Guatemala. Using a draft version of the EERI *Social Science Field Guide* our charge was to profile the disaster from the perspective of social science and suggest further research possibilities. These are our observations, which we now wish to share with a larger audience in the hope that they might be useful to those interested in the human and organizational response to disaster generally, and in the Guatemala earthquake specifically.

I. GUATEMALA

At 3.02 a.m. local time on 4 February 1976 the Central American nation of Guatemala was struck by a devastating earthquake – 7.5 on the Richter scale – which, together with a large aftershock two days later, resulted in widespread destruction, the deaths of more than 22,000 people, injuries to 75,000 more, and a homeless population of at least 1,000,000 [2]. In human terms this was the most destructive earthquake suffered by Guatemala in a long history of natural disaster and was even more destructive than the Managua, Nicaragua earthquake of 1972 [3].

The earthquake occurred along the Motagua fault which runs roughly NE–SW across the most heavily populated parts of Guatemala. The epicenter of the main shock was about 115 kilometers northeast of Guatemala City, and ground breakage was observed for more than 240 kilometers along the fault. Movement

was also detected on a number of secondary faults, several of which extend into the outskirts of Guatemala City. There were hundreds of aftershocks with that largest being approximately 6.0 on the Richter scale – causing further damage, especially to already weakened structures – occurring on 6 February. There was no significant volcanic activity associated with the earthquake [4].

Background

Guatemala has a population of approximately 5,500,000 with a society characterized by what is often called a "dual structure": a large, relatively modern, urban center, and a backward, antiquated, rural hinterland of villages and small market towns. Indeed, Guatemala City dominates the country politically, socially, economically and – in a sense – culturally with a population approximately ten times that of the next largest regional city (Quetzaltenango).

Transport and communication between Guatemala City and the rural areas is difficult, especially in the rainy season (April to October, roughly) when many of the smaller highland towns are isolated for weeks at a time. It is the conventional wisdom that one goes back in time 200 years upon leaving the capital and going 100 miles (or less) into the rural areas. This is a classic Latin American pattern, reinforced in Guatemala by the fact that the rural areas are predominantly Indian in population – non-Spanish speaking and non-Western in outlook, diet, dress, and lifestyle. This ethnic division is one of the historical continuities of Guatemalan society, the importance of which should not be minimized and to which we will return below [5].

The history of Guatemala is marked by major disasters. The first capital established by the Spaniards at Ciudad Vieja was destroyed by a flood in 1541. Antigua, the second capital, was officially occupied in 1553 but destroyed by an earthquake in 1773. Following this disaster, the capital was moved to the present site of Guatemala City, which has also been subjected to frequent earthquakes, the most severe of which was in 1917 when the city was virtually destroyed. The 1976 earthquake is simply the latest addition to this infamous, and continuing, list.

Indios and Ladinos: Two Cultural Worlds

The disaster and its aftermath have brought into sharp focus one of the fundamental characteristics/problems of Guatemalan society: the cultural split between the dominant, westernized, Spanish-speaking *ladinos* and the proud, traditional, but oppressed Indians (*indios*). Such a situation is not at all uncommon in many underdeveloped countries and has exact parallels in several Latin American nation-states from Mexico to Chile, but it is especially the case along the Andean cordillera of South America.

Guatemala is generally considered to have a population which is approximately (all data are questionable on this matter) 3 percent "white", 40 percent "*mestizo*" (mixed blood), and 57 percent "Indian". But this is a racial classification and misses the point. The division in Guatemalan society is *cultural*, not racial, and for all intents and purposes there are only two parts of the society: *ladino* and *indio*.

A *ladino* in Guatemala may be either white, *mestizo*, or Indian by blood. The decisive characteristics lie in cultural attributes: Spanish-speaking; westernized dress, diet, and orientation; and urbanized (in Guatemala meaning Guatemala City, any departmental capital, or any of the larger market towns as a residence). It is also a common characteristic for *ladinos* to look down on Indians as inferiors.

To be "*indio*" in Guatemala is to be rural; Indian language speaking; dressing and eating traditionally; identifying with a specific locale and extended family; and non-western philosophically. Approximately one-half of Guatemala's population could be thus classified.

Although long-run cultural attrition is against

them, the Indians of Guatemala are proud and generally resist efforts to "*ladino*-ize" them. Their perception is that the *ladino* society oppresses and exploits them. Rural land ownership patterns heavily favoring the *ladino* attest to the validity of this perception, for example. The Indians view the *ladino*/town/modern culture as alien and have as little to do with it as possible. Needless to say, the national, departmental, and town power structures are the almost exclusive province of the *ladino*, thus reinforcing the alienation of the Indian who only sees the *ladino* in terms of buyer of labor, economic intermediary, tax collector, policeman, or army conscriptor.

The earthquake and its aftermath brought many Indians into intense and often unwilling contact with the *ladino* culture. Food, water, and medical care were most often the causes for such contact, but even here the gap between the cultures was demonstrated. We heard several stories, from reliable sources, of Indians being brought – more or less forcibly – to hospital facilities for treatment, being treated, and then not returning for follow-up measures such as changing bandages, getting new casts, corrective surgery, etc. The ultimate in culture shock, however, was revealed in one story which was often repeated, with variations: an Indian badly hurt by a collapsed roof or wall was semi-consciously loaded aboard a helicopter and flown to a field hospital, such as that of the U.S. 43rd Medevac. For the first time he was alone (helicopters do not bring family members along), away from familiar surroundings, in pain, and among strange people who did not speak his language and who were doing absolutely incomprehensible things to him. For all the Indian knew this was Hell – literally; psychological trauma was often a serious post-operation problem. The point is that the disaster has laid bare and increased many of the tensions inherent in Guatemalan society. Many friction points between Indian and *ladino* that were hidden or sublimated by public avoidance are coming to the surface as a result of the earthquake, the emergency period, and reconstruction. The situation bears close watching.

As an aside, it may well be that in the long-run it is the poorer *ladinos* who suffer most from this disaster. The Indians are alienated and accustomed to a type of local self-sufficiency, and they draw regularly on their large extended family for resources, both moral and material. The poorer *ladinos*, however, have made the transition to a "modern" society but have not reaped significant benefits thereby. In other words, they have nothing to fall back on if the power structure fails them, which it is likely to do given the scale of the disaster. One final example of the difference between the two cultures might highlight this point. There will not be a significant orphan problem for Indian communities, as the extended family will take care of its own. But there will be, in fact already *is*, a serious orphan problem among *ladinos*: relatively little family structure on which to rely and insufficient government resources to take care of them [6].

Perspectives

There are two general approaches that might have been taken in profiling the 1976 Guatemalan earthquake and suggesting further research on it. The criterion under which we were supposed to work was "relevance to the United States," but this would tend to concentrate our effort on Guatemala City, the national government, and certain emergency organizations – for it is only in the capital city that one finds structures and organizations similar to those in a developed country.

In human terms, however, this was not a Guatemala City disaster. It was a large-scale national disaster (casualties were reported in 17 of the nation's 22 administrative subunits called "departments") and primarily affected villages and small towns in the rural areas. The direct physical effects of the earthquake on the capital were relatively slight. As such, the central government and emergency organiza-

tions headquartered in Guatemala City tried to respond to the disaster, limited by the weak physical infrastructure (transportation and communication especially) of the country. Furthermore, although the central government and foreign donors were important in the emergency period (which lasted about two weeks in this case) and will be important in the reconstruction phase, it was our feeling that much of the "action" was and will remain local, using local resources. This will be even more pronounced during the rainy seasons of the next few years when many towns are traditionally on their own anyway.

In short we had a dilemma. The nature of the earthquake and its effects made it only marginally relevant to the United States but concomitantly quite relevant to at least other countries in Central and South America. As we were drawn increasingly into the rural areas we became convinced that earthquake research should not be limited by arbitrary "relevancy" criteria. But reflecting our dilemma, this profile tries to deal with both perspectives, relevance to the U.S. and relevance to the Third World. Let us begin with the human toll, the casualties.

Casualties

The geographic distribution of casualties (dead and injured) shows a concentration essentially in four departments – Chimaltenango, Guatemala, Sacatepéquez, and El Progreso – which together account for more than 85 percent of the total national casualties (see Table I). This percentage can be increased significantly by adding just one town, Joyabaj, from the department of Quiché.

The rural nature of the earthquake is obvious from these data. Despite early reporting, Guatemala City was relatively lightly hit, with casualties less than 1 percent of the urban population. As outlying areas reported in, however, the picture changed dramatically with the most affected departments counting casualties as high as 24 percent (Chimaltenango), 13 percent (El Progreso), and 10 percent (Sacatepéquez). It should also be noted that the department of Guatemala (including the capital) reaches 2 percent casualties, again indicating predominant effects in the rural areas.

Chimaltenango department was utterly devastated. One of every four people in the

TABLE I

Casualties, by Department

	Population	Casualties			Casualties as percentage of population	Dead as percentage of population	*Material damage (percentage)
		Dead	Injured	Total			
Chimaltenango	195,000	13,754	32,377	46,131	24	7	90
Guatemala	1,100,000	3,350	16,094	19,444	2	<1	40
El Progreso	73,000	2,001	7,662	9,663	13	3	80
Sacatepéquez	100,000	1,551	8,842	10,393	10	2	80
Quiché	300,000	831	5,672	6,503	2	<1	40
(Joyabaj)	(32,000)	(600)	(5,497)	(6,097)			
Zacapa	105,000	693	1,998	2,691	3	<1	20
Total other departments	3,700,000	598	3,907	4,505	<1	<1	–
Total nation	5,500,000	22,778	76,552	99,330	2	0.4	–

*Estimates only.

department was either killed or injured, and this one department alone accounts for 46 percent of the national casualty total and for 60 percent of those killed. Further, as we will see below, 97 percent of the population of Chimaltenango was classified as homeless after the earthquake.

Table II presents further data on various townships (*municipios*). Ninety-two reported casualties or significant damage, and from the total list we selected for inclusion in the table any township that had casualties of 10 percent of the population or higher. Chimaltenango department contributes 12 such townships,

TABLE II

Casualties, by selected township

Department Township	Population	Casualties*			"Material damages"** (percent)
		Dead	Injured	Total	
Chimaltenango					
Chimaltenango City	20, 194	600	3,000	3,600 (18)	75
Comalapa	18,163	3,200	5,000	8,200 (45)	90
Parramos	3,237	200	900	1,100 (34)	90
Patzicia	10,585	811	2,248	3,059 (29)	90
San Andrés Itzapa	8,447	150	728	878 (10)	90
San José Poaquil	9,795	1,000	2,657	3,657 (37)	90
San Martín Jilotepeque	33,066	2,920	6,000	8,920 (27)	100
Santa Apolonia	4,182	900	844	1,744 (42)	85
Santa Cruz Balanyá	2,903	100	600	700 (24)	80
Tecpán	24,101	3,023	7,000	10,023 (42)	100
El Tejar	3,039	50	900	950 (31)	85
Zaragoza	7,317	366	1,000	1,366 (19)	100
Guatemala					
Guatemala City	700,504	1,195	5,550	6,745 (.9)	45
Chuarrancho	6,985	42	1,789	1,831 (26)	60
San Pedro Sacatepéquez	10,714	720	1,667	2,387 (22)	100
San Raimundo	9,225	118	1,543	1,661 (18)	60
El Progreso					
El Progreso City	11,048	1,300	3,500	4,800 (43)	95
El Jícaro	6,197	372	2,538	2,910 (47)	100
Morazán	7,080	134	570	704 (10)	100
Sacatepéquez					
Antigua	26,945	277	1,251	1,528 (6)	25
Jocotenango	3,426	118	582	700 (20)	30
Magdalena Milpas Altas	2,921	135	584	719 (25)	50
Pastores	4,592	127	567	694 (15)	30
Sumpango	10,232	315	1,303	1,618 (16)	100
Santiago Sacatepéquez	7,943	218	1,247	1,564 (18)	40
San Antonio Aguas Calientes	3,866	113	544	657 (17)	50
San Bartolomé Milpas Altas	1,513	27	246	273 (18)	40
San Lucas Sacatepéquez	4,344	157	1,170	1,227 (28)	40
San Miguel Dueñas	4,215	7	524	531 (13)	30
Santo Domingo Xenacoj	2,759	57	560	617 (22)	70
Quiché					
Joyabaj	32,134	600	5,497	6,097 (19)	95

*Figures in parentheses indicate total casualities as a percentage of the township population. Guatemala City and Antigua are included because they are the most important cities in the affected area.

**Estimates only.

Sacatepéquez 10 more, Guatemala 3, El Progreso 3, and Quiché 1.

One of our primary interests was trying to narrow down the exact causes of death and injury in this earthquake. Conversations with medical personnel in both urban and rural areas indicated that the primary cause was crushing due to the collapse of adobe-wall dwellings (usually one-story) with roofs of heavy beams covered with heavy tile. These were deathtraps. The walls could not stand much lateral movement and collapsed, often bringing the roof down with them, and together crushing those beneath. The chief of orthopedic surgery at Roosevelt Hospital in Guatemala City estimated that 85 percent of the operations performed after the earthquake were for the repair of broken and crushed bones, especially vertebrae. The number of such operations was so high that a six-month inventory of supplies was exhausted in 72 hours. After that it was pure improvisation by the hospital staff, including using toilet paper covered with paste for casts [7].

Homeless

Data on the number of people homeless are by department and are, frankly, less reliable than the casualty date. Table III presents the data that we could collect. While important and reasonably consistent with the picture of the earthquake given by the casualty data, some of the figures seem high.

"Homeless" figures for some areas may include people who were inadequately housed *before* the earthquake but who were then counted as technically homeless. Furthermore, translation/conceptual difficulties may be present in that the distinction between "damaged" (*dañado*) and "destroyed" (*destruido*) homes may have become blurred.

The surprises in Table III are the relatively high numbers of homeless reported for the departments of Zacapa, Totónicapan, Baja Verapaz, Jalapa, and Ízabal. Referring back to Table I on casualties, these departments did not seem to be that hard-hit. Discussions with engineers who had been to these more distant areas resolved our problems about the unusual casualty-to-homeless ratio, however. Most of these departments are much lower in altitude than the high casualty areas and are characterized by lighter construction. There was thus considerable damage but fewer deaths and less severe injuries.

We also have some data on "property damage" in Guatemala City, by zones (see Table IV).

TABLE III

Homeless, based on 1973 Population Figures

Department	Population			Homeless as % of combined urban/rural population
	Urban	Rural	Homeless	
Chimaltenango	74,129	120,606	189,192	97
Guatemala	929,209	178,977	434,934	39
Sacatepéquez	72,367	27,621	44,594	46
El Progreso	19,182	53,949	46,092	63
Quiché	34,471	264,215	56,232	19
Zacapa	30,432	75,337	59,044	56
Totónicapan	24,399	142,419	78,037	47
Baja Verapaz	18,852	88,105	46,006	43
Izabal	31,316	138,502	37,431	22
Jalapa	32,628	85,446	36,131	31
All Others	611,206	2,106,913	16,748	<1
Total Nation	1,878,191	3,282,030	1,044,441	20

TABLE IV

Property Damage. Guatemala City, by Zones. Apparently any Property that Suffered Visible Damage

Zones	Percentage Estimate of Property Damage
6	85
5	80
3	70
19	40
9	40
2	30
11	30
12	20
14	20
17	20
18	20

The figures are early and apparently "eyeball" estimates, only. They correspond to our impressions if the translation of "damage to property" in Spanish becomes "property damage" in English, a subtle but real difference. For example, it could be that in Zone 6 there was damage *of some sort* to 85 percent of the structures, but only in that sense does 85 percent seem accurate. We eventually did at least a cursory examination of all zones listed in Table IV.

In terms of accounting for the distribution of the more than 6,700 casualties in Guatemala City proper, the figures on property damage do not seem out of line, especially if viewed as zone-by-zone comparisons. Our conversations indicated that the vast majority of deaths and injuries occurred in the lower income and slum areas of the city – Zones 3, 5, and 6 – where the structures were again of adobe with heavy tile roofs.

There was some "damage" to structures in Guatemala City that might bear a closer look under the "relevancy to the U.S." criterion, however. A number of modern multi-story buildings suffered minor structural damage but could not – or would not – be used because elevators were not functioning, stairways were blocked, utility services were out, or there was other non-structural damage. That is, these buildings were physically intact but functionally useless. The best example was the 15-story "*Triángulo*" building downtown which housed, among other organizations, the offices of the United Nations Disaster Relief Organization (UNDRO). Weeks after the earthquake UNDRO was still operating out of tents on the grounds of a telephone company substation, across from the United States embassy and out of the downtown area, due in part to the functional impairment of the *Triángulo* itself but also because there was marked reluctance by the employees to move back into a high-rise for purely psychological reasons.

Emergency Services: Guatemala City

The reconnaissance disclosed that there were few major problems affecting emergency response organizations in Guatemala City, except for the hospitals. Fire services, police, military forces, telephone, water, power, and other similar services suffered relatively little damage and were able to respond effectively, at least in and around the city. Damage to utilities was restricted mainly to distribution systems in the most heavily affected areas. In most cases service was restored at least partially within one to three days, except in the very hardest-hit neighborhoods where they were not fully operational at the time of our visit. Due to numerous small leaks, however, water pressure was still low throughout the city.

The structure of the national government, centered in Guatemala City, showed some disorganization in the first hours after the earthquake but recovered rather quickly, and the National Emergency Committee (NEC) held its first meeting in the morning of 4 February. The NEC was a kind of "super ministry" headed by the Minister of Defense and directly responsible to the president. Some early personnel and organization problems reduced the initial effectiveness of the NEC, but overall it must be said that the Guatemalan government responded

surprisingly well to the disaster, at least in the emergency period, despite their limited capabilities, especially in the rural areas.

The impact of the earthquake on the hospitals in Guatemala City was a different matter and is worthy of much further study.

There are two major and several minor hospitals or clinics with hospital facilities in the city. The major hospitals are the modern 400-bed Roosevelt Hospital (the reference facility for all doctors in the country) which appeared to have suffered no major structural damage from the earthquake and the General Hospital (San Juan de Dios) of 1800 beds which was heavily damaged and evacuated to an industrial exposition park. Other significant hospital evacuations were those of the Social Security Hospital (200 beds) and the Military Hospital. The Social Security Hospital set up in tents on its own grounds and moved back into its buildings after one month. The Military Hospital also went to tents and to a new section under construction but nearing completion at the time of the earthquake.

The hospital which bore the brunt of handling the casualties was Roosevelt, and although it did not appear to suffer major structural damage it did have troublesome functional problems (emergency generator out, water pump cracked, etc.) and displayed all the difficulties of an overloaded – 5,000 people treated in five days, by one estimate – medical facility: insufficient or unusable (not sterile) surgical theaters, exhausted supplies, exhausted staff, inappropriate or misplaced medical supplies sent in from outside Guatemala, etc. Of critical importance was the rapid exhaustion of such staple surgical needs as X-ray film, tetanus vaccine, antibiotics, anesthetics, plaster, cloth, and "Harrington" rods (used in surgery on fractures). Overall, however, Roosevelt Hospital functioned as well as could be expected under the circumstances, and the staff kept the situation under control. There was considerable insight shown about the non-medical needs of patients brought in from the rural areas: receiving the bulk of those injured in outlying departments, Roosevelt attempted to group patients by home town in makeshift wards and thereby helped to reduce the psychological trauma among those who were experiencing their first "confrontation" with modern medicine.

Emergency Services: Outside Guatemala City

As should be expected, transportation, communications, utilities, and emergency services in general were massively disrupted outside Guatemala City. Confounding a popular myth and conforming to research findings, public order did not dissolve and there was little panic or looting. There were scattered reports, sometimes confirmed, sometimes denied, sometimes both, of "immobility" in certain towns – not burying their dead, for example – but these were the exceptions rather than the rule. Most towns dug out, buried their dead (mass graves in many cases), cared for their injured with almost non-existent facilities, and tried to get help.

If there was one outstanding problem that affected almost all towns outside Guatemala City it was that they were cut off for days from sources of assistance, except for what could arrive by air. The road system in Guatemala is characterized, like most of those in Latin America, by a primary route between towns but few, if any, secondary routes. The same situation holds for communications and utilities, where these exist. Basically, such services are a "modern" overlay on a primitive base, and once the major links were broken all these towns could do was wait – and suffer accordingly.

Our own observations are sketchy but indicate that airborne medical teams and/or supplies were the first to arrive in these towns, then (after anywhere from a day to a week) badly needed water supplies or purification units, and then everything else. As one might expect especially in Guatemala, it appears that

local military units were the first to re-establish communications with their headquarters in Guatemala City, and the military came to dominate the emergency period both locally and nationally.

The International Relief and Supply Problem

Emergency aid and relief supplies came to the assistance of Guatemala from foreign sources in a number of ways: financial contributions to the United Nations Disaster Relief Organization (UNDRO) to be applied to its programs, sometimes with stipulations by the donor country; materials and organizations such as medical teams, sent directly on a bilateral basis by other countries (e.g. Mexico, the U.S., Nicaragua, Honduras and others); large quantities of donated goods forwarded by a wide variety of charitable, professional, and ad hoc organizations; and finally, redirection and augmentation of resources for already existing programs within the country, such as those operated by USAID and CARE.

The major problem arose, as it has in many major disasters, with the flood of goods from relatively unorganized sources, especially ad hoc groups. There are tremendous costs associated with the collection, transport, sorting, cleaning (if needed), distribution, and cultural acceptability of such goods. Often this takes money, labor, space, and transport vehicles away from higher priority needs. Moreover, there are conflicting reports about what is needed and wanted, which confuses potential donors and causes much ill-feeling on all sides. This is not a new problem, but it is a sensitive one. There was considerable criticism in the United States after reports began to filter back that local Guatemalan consuls in various U.S. cities made "unlimited" requests for aid when, in fact, such aid was largely unnecessary. What is lacking in criticism of this latest relief problem is an appreciation of the fact that the status of the local Guatemalan consuls at home (in Guatemala) depended in large part on their being able to show how much "stuff" they generated from their areas, and quantity is important in such situations. Relevance and utility at the site of the disaster are secondary considerations. It should be noted, however, that the administration of relief supplies once they were in Guatemala was relatively honest. We heard very few reports of any large-scale pilferage or fraud, despite ample opportunity in the early emergency period.

We were able to explore more fully the problems associated with foreign relief to hospitals, and frankly, much of the foreign medical supplies that arrived contributed to the problem rather than to the solution. Much was unsorted, poorly packaged, unlabelled, or, more dangerously, mislabelled, and often obsolete. In one instance a box was discovered marked "Glucose solution" that actually contained an alcoho! compound. It was fortunate that a medical staff member would not use it because he had never seen *pink* glucose before.

The amount of medical supplies that arrived was truly staggering. A warehouse was filled at the airport and a garage at Roosevelt Hospital. It was estimated that it would take a team of pharmacists about four months just to sort the supplies that arrived the first month, by which time even more of the medicines would be past expiration date. The tonnage was a problem in other areas as well: plaster, a critical early need, was lost in the deluge and found only weeks later. In some cases the wrong materials were sent, either from misinformation or assumptions about what would be needed. For example, some of the early planes carried burn packs, but burn injuries were virtually nonexistent.

The arrival of foreign personnel, on an ad hoc basis, was another problem. Many came to help but could not speak Spanish (much less one of the Indian languages) and did not have a source of supply. Skills without supporting facilities are useless, or worse, a drag on local people trying to function with too little equipment in the first place. Integrating foreign doctors into

the process at the height of the problem was virtually impossible. This caused further resentment.

The foreign operations that were of outstanding success were those that were largely self-sufficient: field hospitals such as those of the U.S., first-aid stations from Nicaragua, and Mexican field kitchens – with all supplies trucked daily from Mexico. Indeed, a fascinating bit of research might focus on how the Mexican public corporation "Conasupo" (a national food store chain) mobilizes, supplies, and finances an operation such as that in Guatemala where it served 100,000 meals daily in Guatemala City. It was truly an impressive operation.

Perhaps the ultimate example of a lack in communication and resulting misperception involved the sending of food to Guatemala for distribution in the rural areas. The point is that the Indian population does not share our western definition of what is "food". We had numerous stories of various canned foods (from hams to peaches) being fed to dogs or pigs because, for an Indian, what comes in a can is not "food". Furthermore, food was not really a critical problem in most rural areas as a good corn harvest had just been brought in, and corn is the staple of the Indian diet. *Distribution* of the existing food supplies was the problem.

II. RESEARCH SUGGESTIONS AND OBSERVATIONS: GUATEMALA AND ELSEWHERE

As stated in the introduction to this article, this concluding section is devoted to suggesting further research on issue areas which, although specifically related to the Guatemalan case, have implications for earthquake/disaster research in underdeveloped – and especially Latin American – countries in general.

Housing

On the national level the provision of temporary and long term shelter for the more than 1,000,000 Guatemalan homeless is critical if there is not to be a significant rise in deaths attributable to indirect earthquake effects. As the rainy seasons progress there is danger of major epidemics of respiratory diseases in the areas most affected by the earthquake which, like Chimaltenango department, are high and cool. The problem of shelter poses some other difficulties for the Guatemalan government that bear watching. There was no large-scale program or organization at the national level concerned with housing before the earthquake, and the question of shelter raises the first long-range problem that, apparently, the National Emergency Committee (or its successor) must face. Research here might well focus on the ability of the Guatemalan military government to deal with a long-range and relatively complex issue that does not have the "glory" attached to it that the provision of medical care, food, and water did in the emergency period.

The housing question might also be a good vantage point from which to watch the possible re-emergence of individual ministries and their relationship to the NEC and the president. It was of interest to us that during the emergency period, the NEC was supposed to be the only channel to the president with regard to emergency activities, but we had several local sources indicate that traditionally powerful ministries (Finance and Foreign Affairs, for example) were doing their best to maintain independent lines of access. The point is that a major disaster (or more precisely, the response to it) often changes political and bureaucratic priorities and provides unparalleled opportunities to observe intra-governmental competition over newly evolving functions. The provision of both short- and long-term shelter is usually one of those new functions.

In Guatemala, a further issue of interest was the degree to which external pressures were "forcing" the national government into a housing program. We could see the beginnings

of this in the time that we were there, with CARE taking the role of initiator. In that sense, the housing question was taking on international and transnational aspects, complicating the issue even more.

One particular fact with foreboding implications is that, as we were leaving the rural areas, there were unmistakable signs that many families were rebuilding their homes – with adobe and tile. Despite their own reluctance to do so and a government campaign to discourage such reconstruction, the people were saying in effect that "the government *may* come, but the rains *will* come". They were rebuilding with the materials available, which they knew how to use and could afford, the implications of which are grim.

Medical Services

In Guatemala, as in many less-developed countries, hospitals and related medical services in the urban areas are directly modelled on those in the United States or Europe, and as such, their experiences are often of the greatest relevance to medical services in the developed countries. For example, in Guatemala City, the General Hospital would be the logical focus for research on the process and problems of evacuation and temporary, off-site, operation, while Roosevelt Hospital was classic as an overloaded modern facility attempting to give treatment to urban residents as well as to the most seriously injured from the rural areas. Research foci might be how the various hospitals handled (1) their evacuations, (2) the influx and allocation of patients from the outlying areas and the city itself, (3) inter-hospital relations and coordination of treatment, (4) relations with field hospitals and first-aid stations, (5) the operation of temporary facilities, (6) record keeping, and (7) the arrival of foreign medical personnel and supplies. Also, it is our belief that a structural engineer should look at any evacuated facilities because, in some cases, it did not appear that damage was so great as to necessitate the drastic and disruptive step of evacuation. Our question would be, on what basis and on whose advice was such a decision made?

The Guatemalan case has also brought up some further questions of potentially general applicability, but they are so sensitive that great care must be taken in their investigation. First, we found it perplexing that a high official in the Guatemalan Red Cross did not even know that the Military Hospital had been evacuated, much less its location at the time of our visit. Treading gently, it would be fascinating to explore what relationships there were, if any, between military and civilian medical facilities in Guatemala City prior to and during the emergency period. Second, we had conflicting reports on whether or not private doctors offered their services to emergency medical facilities. Again, this is a sensitive issue, but it should not be avoided solely for that reason.

International Relief

The Guatemalan disaster again illustrated the problems associated with the more or less unorganized influx of large and varied quantities of relief supplies. The well-motivated but often burdensome results of ad hoc, essentially private, relief efforts point up the need for policy-oriented research in this area. The problem is not so much with the established international relief agencies (CARE, Salvation Army, Red Cross, etc.) but with the deluge of donated goods that arrives, often unannounced and unexpected, at or near the scene of a disaster. Research must be done on this problem so that policy and organizational alternatives can be identified. Sooner better than later, we must develop methods to screen, sort, and if necessary divert, relief supplies as they are collected in donor areas and to define priority needs in a stricken area so that the supplies that do arrive are effective, in the appropriate amounts, and culturally acceptable.

Rural Research

Given that the major impact of the earthquake

was in the rural towns and villages, these become a primary focus of research, as it was in Guatemala. In such situations it is probably best to divide research into the town's or village's *isolated* period and then the period *after organized assistance arrived.* The questions would be the usual: What did the local authorities do? How and by whom were the dead and injured removed from the rubble, cared for and/or buried? Where was food and water found or supplied, and by whom? How and when did outside assistance arrive? What form did it take and how did it relate to on-going local efforts?

In Guatemala, it would also be tremendously interesting to see how much effort and funds are allocated to reconstruction of predominantly Indian villages versus how much is allocated for predominantly *ladino* towns, especially the *ladino*-dominated market towns which are the point of economic interaction between the two cultures. This issue could focus the latent tensions between the two sectors of the society.

At this point we would like to share some practical thoughts and observations on rural research in underdeveloped countries because in-depth research in such areas is often affected by some very practical considerations: lack of support facilities and, for sustained periods, physical isolation. In Guatemala, the damage suffered by many towns was so severe that one could not really justify consumption of the water, food, and shelter that a research team would need, even if dollars could make such resources "available". Nonetheless, extended and in-depth research is possible in even the hardest-hit towns if a team is prepared to bring enough into the field so as to be self-sustaining and thus neither a physical nor psychological burden on the local populace. Self-sufficiency is the key, however.

The periodic isolation problem of rural towns in countries with weak transportation infrastructures enhances this need for a research team to be as self-sustaining as possible. Consider the fact that in the 1970 Peruvian earthquake there was only one road up the Callejón de Huaylas, and in 1976 in eastern Turkey, winter made the unpaved roads of the area virtually impassable. As noted previously, in Guatemala the isolation problem is largely a function of the rainy season, but contributing to the isolation of much of highland Guatemala, at least in the near future, is the probability of continuing landslides. There were hundreds caused by the earthquake itself, and the emergency road clearing that we saw undercut many hillsides and thus virtually guaranteed further slides [8]. A large number of landslides also blocked many river and stream valleys, creating major hazards as water built up behind these temporary and highly unstable "dams" and thus threatened downstream communities. Overall, the conclusion was obvious: An essentially foreign research team must be mobile and self-sufficient for both moral and practical reasons.

* * *

Finally, reconnaissance reports are one thing but in-depth research is quite another. It is our hope that this account may stimulate some further research that will be useful, perhaps to the United States but more likely to other developing countries with social and organizational structures similar to those of Guatemala. It will be truly a sad comment if the only research formulated follows the criterion of "relevance to the U.S.," and we witness another, carbon-copy, disaster in Central or South America within the near future. In sum, most of the nations that suffer periodic earthquakes are underdeveloped, not developed like the United States, and it seems to us that social science earthquake research has an obligation to at least attempt to provide useful knowledge to these countries as well.

NOTES

1 Seers (1969: 2–6) chooses these dimensions as characteristic of underdevelopment in order to avoid reliance on simplistic measures such as gross national product or national income.

2 All data presented here are from the Guatemalan government and/or from the United States embassy in Guatemala.
3 We were part of a research team that went to that disaster as well. For the results, see Robert W. Kates et al. (1973).
4 We wish to thank the United States Geological Survey (1976) for this information.
5 For a brief description of this ethnic division, see Richard N. Adams et al. (1960: 238–57). The Mexican sociologist Rodolfo Stavenhagen (1975: 108–16 and 163–233) has also dealt with the issue. For a rather uneven and impressionistic, but firsthand, view of highland Guatemala after the earthquake, see Gerry Nadel (1976: 21–9).
6 A similar observation was made by Richard W. Patch (1971: 14) following the 1970 Peruvian earthquake/landslide disaster. He states that "in spite of the hardships imposed by the catastrophe, Spanish-speakers and Quechua-speakers are still very far apart. Many of the latter remain peons. Nearly all have their homes and goods undamaged and some have sufficiently large numbers of cattle to consider themselves wealthier than many now destitute Spanish-speakers of the towns. But increased interdependence has not bridged the social gulf. Quechua-speakers are 'Indians', Spanish-speakers are 'people'. The greatest physical cataclysm of the Western Hemisphere has not changed this relationship."
7 Our thanks to Ms. Janice Pieper, who worked at Roosevelt Hospital for six weeks sorting relief supplies, for this information.
8 For example, the United States Army, in its efforts to clear the main highway linking Guatemala City and the Atlantic port of Puerto Barrios, encountered 44 major slides blocking the 300 kilometer-long road and had to remove an estimated 325,000 cubic yards of debris. On this operation, see United States Agency for International Development (1976: 16–7). The road clearing that we saw was mainly in the other direction, toward the rural areas of Chimaltenango and Sacatepéquez, and it was much less sophisticated.

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THE GUATEMALA EARTHQUAKE OF 4 FEBRUARY 1976: CASE STUDY OF A DISASTER RELIEF AGENCY'S OPERATIONS

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INTRODUCTION

In February 1976 the Brother's Brother Foundation (BBF), an international medical and disaster relief organization working in Guatemala since 1969, fully mobilized its resources to provide emergency relief and reconstruction assistance to the survivors of the earthquake of February 4.

The Brother's Brother Foundation was one of more than a hundred disaster relief agencies operating in Guatemala after the earthquake; the $ 1 million of aid provided by the BBF represents about one percent of the total relief sent to Guatemala. The BBF was involved in relief activities across the spectrum of needs: medical personnel and supplies, rehabilitative materials (food, tents, etc.) and reconstruction tools and materials. Further, the foundation operated both at the national and community level. Because its size, scope and locus of operation, the foundation is characteristic of many disaster relief agencies. A review of its Guatemala operation, including the administrative and organizational dimensions of the response, may prove helpful to other relief agencies as a source of information, criticism and recommendations for future efforts. To place this review in perspective, background material regarding BBF is included.

The author wishes to thank officials of the Guatemala Ministry of Public Health, the Rotary Emergency Committee and the USAID mission in Guatemala for the willing provision of information used in this article.

BBF Background

The Brother's Brother Foundation began in 1958 as an international medical foundation providing public health services and instruction. After pioneering a number of smallpox irradication techniques – the founder of BBF developed the jet injector and smallpox dilution techniques – BBF shifted its main emphasis from West Africa to Latin America in 1964. Since 1965 it has assisted in the delivery of 10 million immunizations in eleven Latin American countries. The health ministers of several of these countries asked BBF to assist in disaster relief and rehabilitation programs and to expand its services to meet emergency needs. BBF responded to disasters in Peru 1970 (earthquake), Nicaragua 1972 (earthquake), and Honduras, 1974 (flood) with a supply delivery valued in excess of $ 1,200,000, including antibiotics, food, medical equipment, insecticides and vegetables and grain seeds for replanting.

Given this pattern of repeated responses to disaster situations BBF chose in 1975 to formally create a disaster relief division with four distinct functions: 1) research and planning
2) communication and coordination
3) mobilization and 4) review.

In 1969, BBF initiated its first health program in Guatemala, working with the Ministry of Public Health in a limited measles campaign. In 1972 and 1973, BBF joined with the Ministry of Health and local Rotarians in

organizing and financing the first national anti-polio program, protecting 80 percent of the children under five years of age. BBF also joined with Guatemala Rotary in distributing vegetable seeds to 10,000 peasant farmers and limited medical services in 1973, 1974 and 1975.

BBF in Guatemala: 1976

The BBF staff first heard of the earthquake through the news media at 7.30 a.m. on February 4, 1976 and immediately recognized the severity of the disaster, given the strength of the quake and the population density of the area. By mid-morning BBF staff had alerted its executive and disaster committees to an expected request from the government of Guatemala and suggested task assignments in preparation for a general mobilization of resources.

By 12.45 p.m., BBF established direct and radio communications (telephone lines were alternately disrupted or overloaded) with Guatemala through the wife of the president of Guatemala City's Rotary Club. She provided BBF with general geographic descriptions of damaged areas.

Around 1.30 p.m., the BBF conferred with Guatemala's ambassador to the United States, who made an official request for BBF assistance on behalf of his country. At that time, he was unable to give details of the actual situation. The ambassador expressed the view that the BBF might know better what was needed than he or his staff and promised to transmit up-to-date reports as the embassy would receive them.

During the next 18 hours, initial request lists (medicine, food, tents, etc.) from the Guatemalan government were received and indirect contact was established with the hastily reorganized National Emergency Committee of Guatemala (NEC) through the Rotarian radio contacts and the Guatemalan embassy.

At the same time, Rotary Guatemala established the Rotary Emergency Committee (REC) to provide assistance in the relief effort. With the approval of the NEC, this committee served as BBF's contact point in Guatemala. REC also organized itself and a women's auxiliary into several committees and task forces related to the specific needs: medical, housing engineering, sanitation, finance, cottage industry, public relations, agriculture and governmental relations, etc. This immediately assured the foundation of a broad level of voluntary but organized local technical expertise which was able to properly and precisely represent and advise BBF operations in Guatemala.

During the first 72 hours after the Guatemalan earthquake the BBF executive committee, disaster committee, staff and interested members had to determine the general needs of the Guatemalan people and the role the BBF should play in fulfilling those needs as quickly as possible. The BBF fully expected to enter a confused and fluid situation.

MEDICAL NEEDS

Confronted with 77,000–100,000 injured, over 1,000,000 homeless, facilities for one third of the 14,000 bed National hospital system destroyed or badly damaged and water systems damaged or disrupted for almost 2,000,000 Guatemalans, the Ministry of Public Health (MPH) was forced to expand upon the national medical preparedness plans and make a series of rapid adaptations to the critical situation.

Mobilization

The NEC and MPH immediately mobilized all available medical professionals and paramedical practitioners (over 7,000 of them) to treat the injured in established medical facilities and emergency clinics throughout the nation. The mobilization included the temporary closing of all health-related schools, and the organization of volunteer medical

brigades from the private sector and the schools of health professions.

Foreign Solicitation

NEC made immediate appeals for delivery of blood plasma, field hospitals, orthopedic supplies, anesthetics, etc. Within the first month, over 200,000 pounds of these supplies (including nine field hospitals), conservatively valued in excess of $ 5,000,000, were made available. Even though these supplies did not all arrive during the disaster period, the knowledge of their availability permitted NEC and MPH to use medical stocks already in the country on a more rapid and adequate basis. Over 85 percent of the medical supplies received from all sources were usable.

NEC also made a number of appeals for foreign medical staffs which could serve independently or as an auxiliary to established facilities. In response to these requests, almost 500 medical volunteers were sent from Argentina, Dominican Republic, Honduras, Mexico, Nicaragua and the United States.

Unfortunately, not all these groups were utilized to their maximum potential because of cultural, as well as, administrative problems. For example, congressman Kenneth Hechler of West Virginia, who made a personal survey of the Guatemalan disaster zone in mid-February, found that the US field hospital with 100 beds and 200 employees was treating only 3 patients because the appearance of armed Guatemalan guards at the gates seemed to frighten prospective patients away.

Scores of other unrequested medical volunteers also arrived from the United States. On the whole, they were not very successfully integrated into the relief system.

Public Health Measures

NEC and MPH undertook an immediate program to provide safe drinking water. NEC and other agencies under its guidance established hundreds of chemically-treated water distribution points and pushed the redrilling of water wells in the disaster sites. NEC and MPH also reinforced the national disease monitoring system under the guidance of the World Health Organization (WHO) and USAID.

For a short period after the disaster NEC and MPH debated the necessity of an immediate mass immunization campaign against typhoid. The NEC, composed largely of non-medical people, was asking for a national immunization campaign against typhoid. On the other hand, the public health officials and WHO opposed such a program, because the dry season made the transmission of typhoid much less likely. In addition, such a massive program would pin down a large portion of the already overworked medical staff and volunteer auxiliary in an expensive and slow needle-and-syringe campaign when these professionals were desperately needed elsewhere. After considerable discussions, it was finally decided to greatly reduce the scale of the proposed immunization effort and, in effect, to assign this operation a relatively low priority.

Long-Term Supplies

With 14 of the nation's 38 public hospitals and 27 of its 108 large clinics destroyed or badly damaged and the sewage systems in many towns out of commission, the need for long-term assistance in the rehabilitation and reconstruction of these facilities was of paramount importance.

MPH therefore approached international institutions such as the Inter-American Development Bank for emergency building loans and made appeals for grants and equipment to almost all possible sources.

The full outcome of these appeals remains incomplete as yet, but at least $ 40,000,000 in loans and $ 2,000,000 in equipment has been made available to MPH and sanitary departments around the country.

BBF'S MEDICAL PROGRAM

Medical Supplies

Based on previous experiences in Peru, Nicaragua, and Honduras, the BBF saw the need for orthopedic and surgical supplies and equipment for immediate use, as well as to replenish existing stocks as they were passed through the system. Other medicines, such as antidiarrhetics, respiratory medicines, and antibiotics would be required later for survivors exposed to the cold, dust and to the unsanitary conditions of the crowded refugee centers.

Within five days, the Brother's Brother Foundation had over 22,000 pounds of these supplies available for immediate shipment. As the foundation learned of the number of emergency field hospitals (nine in total) arriving in Guatemala, it chose not to solicit such equipment on an emergency basis.

Medical Personnel

If there was a need for emergency medical teams, it was essential that they be able to integrate into the existing systems as quickly as possible. Less than nine hours after the disaster, the BBF offered the Guatemalan ambassador in Washington, D.C., transportation by private plane and coordination for all Guatemalan medical professionals living or training in the United States who wished to return to Guatemala as volunteers for two weeks or more.

In this respect, the BBF believes that nationals are best able to treat their own people since they obviously know the language, culture, medical system, and given the small size of Guatemala, most of their medical counterparts in the country. BBF had undertaken a similar operation in Honduras two years earlier with great success.

Between February 5 and 12, the BBF received calls from 21 Guatemalan physicians who were prepared to leave at 24 hours notice. As events developed, the NEC and Ministry of Health chose not to fully activate the offer as their own medical teams were well organized and in operation, and hundreds of requested (and unrequested) medical professionals poured into Guatemala from several different countries and organizations.

Unfortunately, the BBF offer was either mistakenly publicized by the Guatemalan embassy in Washington, D.C. or misunderstood by other agencies. This resulted in hundreds of calls from well-meaning but unskilled volunteers across the country. For example, the Red Cross in New Mexico referred to BBF a 21-year-old female art student who spoke no Spanish and who had volunteered to work in Guatemala for the weekend. In a sense, however, this mistake had its benefits since it allowed BBF to serve as a lightning rod for these types of assistance offers, helping to free the overworked telephone lines and staff of the Guatemalan embassy and other agencies.

Public Health Measures

Through the Guatemalan embassy, the BBF offered the use of its jet injectors (20 in total) for mass immunization against typhoid or other feared diseases (e.g., measles) during and after the crisis. The BBF believed that if its equipment, along with some of its technical staff, were used, any proposed immunization program would be greatly accelerated. If a national campaign were to take place, even if medically unnecessary [1] as was the case in Nicaragua, 1972, it was wiser to expedite the program with the faster and cheaper jet injector.

In addition, the BBF delivered 3,600 pounds of calcium hypochlorite of sufficient potency to sterilize a minimum of 200,000,000 gallons of water, enough for 10,000 rural families for a year.

Long-Term Solicitation of Supplies

The BBF had an opportunity to use the disaster to mobilize medical resources (i.e. medical, dental equipment and vaccines) over the next several months which, while not being available or even necessary for immediate use in the emergency, would prove very beneficial in the future to the Ministry of Public Health, which was obviously going to be desperately short of funds and materials in the reconstruction phase. The Ministry of Health reported severe damage (25–50 percent destroyed) in 14 of the nation's 38 public hospitals including the largest, San Juan de Dios: this 1,200-bed facility was completely destroyed, as were 27 of its 108 major health centers.

Between April 15 and December 31st, 1976, BBF delivered enough permanent hospital equipment (hospital beds, X-rays, instruments, food carts, autoclaves, linen, etc.) for a 100-bed facility and 20 complete dental operatories with a used replacement value in excess of $ 200,000. Most of this equipment was donated by North American hospitals and private clinics, as they remodel and otherwise upgrade their facilities.

It should be noted that much of the equipment provided in the nine field hospitals immediately after the quake was less than standard (i.e. collapsible wooden cots, manual suction machines, etc.) because of emergency transport constraints and therefore was of limited or no value over the long term. This made the delivery of permanent medical equipment a separate category of significance.

REHABILITATION

As the reports of destruction continued to mount, it became obvious that there was a critical need to provide assistance to the general refugee population in terms of food supplies, clothing, housing, and reconstruction of commerce. As a medical foundation, the BBF would, of course, not be in a position to provide independently all such needed services because of its small staff as well as its primarily medical focus.

However, through the Rotary Emergency Committee and, later, Episcopal and Baptist groups, the BBF was requested to serve as a facilitator by providing refugee care supplies: food, tents, some medicines, reconstruction materials, and cash.

Within six months, the BBF was able to contribute and deliver $ 40,000 in cash, and over 400,000 pounds of building materials with a wholesale value of over $ 162,000. In addition, the BBF delivered a quantity of canvas tents, 110,000 pounds of prepared food and $ 145,000-worth of selected vegetable seeds.

REC Rehabilitation Program

The Rotary Emergency Committee (REC) was the largest recipient of BBF's rehabilitation supplies (some 90 percent of them) valued at about $ 450,000. It seems therefore worthwhile to explain some of the features of REC's approach and program.

On February 6th, REC was requested by the National Emergency Committee to assume major responsibility for the relief and later reconstruction of the San Pedro, Sacatepequez district (population 15,000–17,000) classified as 99 percent destroyed with 770 dead and 1,700 injured. The area's major source of income was cottage industry textiles, clothing and leather goods for the tourist trade, and small scale agriculture.

On February 7th, one day after it was asked to "adopt" San Pedro, REC representatives began to distribute locally acquired relief supplies (i.e., food, some medicines, clothing, agriculture, etc.) in the area and first met with local officials and other leaders of San Pedro to develop a systematic and comprehensive response.

The REC committees made technical and administrative decisions as required and in accordance with NEC guidelines and the wishes of

local leaders. Using local labor, over 2,000,000 cubic feet of rubble was cleared within a period of seven months and a number of major buildings completed; warehouses, schools, churches, and over 2,700 houses (240 square feet each) were built; thousands were gainfully re-employed in handicraft industries and agriculture, and over $ 500,000 of emergency housing and business loans ($ 1,000 maximum at 4 percent interest) from local banks were distributed throughout the area.

Immediately, the REC began to systematically take over "ad hoc" feeding and some medical responsibilities from NEC, the Red Cross and CARE. In addition, the NEC also handled the distribution of clothing, bedding, tents, etc., among the refugee population using its own volunteer staff and logistical system. Throughout this period the REC made successful appeals for assistance from Rotary Clubs worldwide, from the BBF and from companies employing, or in some way affiliated with REC members. REC received over $ 460,000 cash and $ 600,000 gifts-in-kind by January 1, 1977.

In addition BBF received $ 42,000 from REC generated sources (i.e., U.S. companies and Rotary Clubs) which were channeled back to REC as direct cash payments or purchases.

Reconstruction

Once the acute emergency phase had ended – the injured cared for, the dead buried and the destitute survivors provided with a regular flow of food, water, clothing, etc. – the emphasis shifted to the reconstruction of housing and the local economy. U.N. officials had estimated that one in twenty might have died if adequate shelter had not been provided by June, the beginning of the rainy season.

Aside from the immediate relief work, REC and volunteer university students from the capital conducted a general census (within a month of the disaster) to ascertain the characteristics and needs of the surviving population. The major finding of this census disclosed that over 80 percent of the remaining San Pedroeans were home-owners rather than tenants. Many hundreds of the tenants fled to the capital some 15 miles away having lost everything in the quake.

This surprising feature led REC-SPOL (San Pedro Officials and Leaders) to greatly curtail plans for a new rationalized street design for the larger towns. The vast majority of families insisted on rebuilding their homes on the only significant undamaged possession left by the quake, namely their small house lots. This, in turn, greatly complicated reconstruction plans, since each house had to be built separately, so as to fit each distinctly shaped lot.

REC assigned a full time administrator with engineering skills to live in San Pedro and guide the reconstruction process. In accordance with NEC, all able-bodied men were required to work in exchange for food, tools, and reconstruction materials. NEC also established rebuilding guidelines so as to minimize human casualties in future earthquakes. These guidelines included the replacement of traditional heavy Spanish tile roofing and mud adobe walls because of their tendency to crumble under stress [2]. Instead, NEC instructed all rebuilding programs to use lighter weight corrugated metal roofing and reinforced concrete or cement blocks. In addition, REC assigned volunteers on a daily basis to serve in medical, clerical and/or distributive units.

BBF RESPONSE TO REC NEEDS

Food

On February 5th, BBF was requested by NEC and REC to provide any and all quantities of prepared foods for immediate shipment. Within ten days, the BBF secured 110,000 pounds of the requested foods and began to process them through to Miami for shipment to Guatemala. In the interim, the NEC had completed a survey of undamaged food stocks within Guatemala

and of foods already sent by other sources. As a result, the NEC was able to decide to remove food as a top priority item. This, in turn, allowed the BBF to transport these supplies, already in the system, by sea rather than by air, greatly reducing freight charges.

The food items which thus arrived after the worst was over, were distributed to hospitals, orphanages, and schools. Some 71,000 pounds of food items were in cafeteria size containers. Some 36,000 pounds was candy distributed to children throughout the disaster area as a pleasant, if non-essential, commodity (largely during the Easter week in mid-April). This was a very symbolic time since national reconstruction had really gotten underway, providing for many religious analogies.

As in Honduras in 1974, the BBF insisted that all types of available foods should be specifically approved by the Guatemalan authorities before shipment, since they would be responsible for thcir distribution. This simple policy saved NEC, REC and BBF enormous amounts of valuable time and money. For example, one large food company offered BBF 820,000 pounds of canned food for immediate shipment. BBF contacted NEC, the Ministry of Public Health and REC about the possible utilization of this material. All three reported back to BBF that 90 percent of food was either unnecessary, given the level of current food stocks, or not suited to the Guatemalan peasant. Over 80 percent of the food offered was cream of mushroom soup, which, while having some nutritional value, was considered poisonous in the folklore of the Guatemalan peasant.

Furthermore, most of the refugee population was not accustomed to canned foods, and might open a can, eat a little one day, and eat the rest two days later, not knowing that without refrigeration it could lead to food poisoning. Therefore, the canned food supplies brought in by the BBF were distributed to mass feeding stations which had experience in handling canned food (such as hospitals). A California disaster relief agency picked up the remaining 750,000 pounds and delivered them to Guatemala one month later.

Reconstruction

On the morning of February 7, less than eighty hours into the disaster, the BBF was requested by REC to supply as much building material, roofing, and as many tools as possible for the San Pedro Project. Because BBF had never before undertaken a major rebuilding effort, some BBF members were hesitant, claiming a lack of material resources and expertise, even though many REC members were architects, contractors and civil engineers. Yet because BBF is headquartered in Pittsburgh, Pennsylvania, it was able to approach the area's metal industries and provide 90 percent of San Pedro's roofing needs with the help of those industries.

By February 20, they had donated, or offered at a fraction of the cost, to the BBF over 1,000,000 square feet of aluminum and steel corrugated roofing material (enough for 3,700 homes and other buildings) 1,400 hand tools (picks, shovels, saws, hammers, etc.) nails, electrical supplies, etc., with a normal wholesale value of $ 162,000. The BBF total purchase price for these items was $ 35,400. Some 75 percent of the transportation cost for these items to Guatemala was provided by the USAID.

BBF also enlisted the volunteer services of Church World Service's housing consultant and requested that an REC engineering representative come to Pittsburgh for inspection of potential roofing materials. The Church World Service consultant provided REC with additional building experience, and BBF with a monitor of building progress in San Pedro.

Aware of REC's immediate need for funds, the BBF gave the REC $ 6,000 to help to pay for rubble clearance. Later in March and again in June BBF donated another $ 33,500 cash for the REC general fund and reconstruction, including a designated $ 27,500 grant to build an artisan market in San Pedro, to serve as a workshop and display center for local handicrafts.

Agriculture and Commerce

In order to help the San Pedro population become self-sustaining once again, BBF supplied REC with $ 145,000 worth of vegetable, and some flower seeds which were distributed to small scale farmers throughout the area [3]. Since 1973, Rotary Guatemala, using their own expertise, had been distributing, and monitoring the use of, seeds donated through BBF.

The BBF also enlisted the help of volunteer agronomists from the H.J. Heinz Company and the export manager of Burpee Seed Company, himself a Guatemalan, so as to assure potency and suitability of donated vegetable seeds for the Guatemalan peasant.

REVIEW: MANAGEMENT

The BBF chose to confine its role to one of a facilitator providing funds, material, logistics, and technical expertise and quite naturally, leaving the main burden of organization and labor to the Guatemalans themselves. It was, indeed, a difficult, and at times an exasperating role, in which there was plenty of room for successes and failures. The major areas of concern can be classified as follows: 1) information and coordination; 2) controlled solicitation; 3) transportation; 4) internal controls and mobilization; and 5) periodic review.

Information and Coordination

Understandably, once a request for assistance has been made, the first and most important step of any disaster relief agency is to gather as much timely and accurate information as possible about the crisis area and the resultant needs. This gives the agency a greater likelihood of making proper decisions regarding the type, intensity, and timing of the responses.

In conjunction with this, it is essential to establish some type of information exchange and coordination with the host government and other relief agencies involved, so as to minimize unnecessary duplication and maximize the use of available resources. Generally this is done by the host government and, if necessary, a single international agency or a consortium which can advise and may assist in the delivery of needed resources to the people.

In the Guatemalan case, the BBF was able to intensify its traditionally good relationship with the Ministry of Public Health and Rotary, maintaining a constant flow of information and cooperation. The Rotary–BBF relationship was at times so close as to be considered almost symbiotic.

The need for immediate coordination and cooperation among prospective donors and recipients is of course a paramount concern in a sudden disaster situation. As a small organization – one of the more than 100 foreign relief agencies involved in Guatemala – BBF was in periodic contact with seven coordination and/or information centers:

(1) National Emergency Committee (NEC) of Guatemala; largely composed of military leaders and their allies loyal to the government.

(2) Various governmental ministries which, while loyal to the central government and often represented within NEC, were trying to reassert their authority and prerogatives once the crisis had become less critical.

(3) American Council of Voluntary Agencies of Foreign Service, Inc., New York, which served as an after-the-fact information gathering system.

(4) Office of United States Foreign Disaster Assistance (USAID): A State Department office with a capacity to direct all U.S. governmental relief. The Office also attempts to direct and assist the activities of U.S. private voluntary agencies using large amounts of money and materials to facilitate joint projects.

(5) Guatemala Survival Mission, Washington, D.C.: An ad hoc organization of university students in the Washington area.

(6) The Christian Pilots Association, United

States. The Pilots Association was requested by the Commandant of the Guatemalan Air Force to coordinate and inventory the inflow of airlifted supplies from the United States, an activity also claimed in part by the Office of United States Foreign Disaster Assistance.

(7) A group of young Guatemalan nationals working in international agencies such as the Inter-American Development Bank.

Other coordinating and information-gathering agencies such as the United Nations Disaster Relief Office and the Organization of American States were contacted after the crisis period had passed.

Given the number of coordinating agencies, each with its own capabilities and perspectives, it is understandable how conflicting reports and evaluations might be circulated which blur, rather than clarify, a rapidly evolving situation. This was especially true as some of the foreign agencies attempted to impose their perspectives. For example, within the first week of the disaster, the BBF delivered an inventory list of medical supplies that were immediately available for delivery via private corporate aircraft. The Ministry of Public Health went through the list and chose the urgently needed items, with most of the other supplies to come by ship, and rejected some of them completely as already in stock. Three days later and just before the flight, the corporation donating the aircraft contacted one of the better known foreign relief coordinators and was told not to send the aircraft as it was no longer necessary. The BBF then had to explain to the Health Ministry that the expected flight had been cancelled. Guatemala's ambassador to the United States then called the company and made an official request for the aircraft's use. By now, the company, which had just been reported to have made some legally challenged international payments, refused, not wanting to become involved in potentially controversial international activities again. (The coordinating agency responsible later expressed its regrets to BBF for the misjudgement of one of its staff members.)

As another example, the BBF was asked by NEC to help provide the equivalent of a 400-bed field hospital along with some volunteer staff. The NEC felt the necesssity of replacing some of the other foreign medical groups and their own exhausted medical staffs for a two-month period. The Ministry of Public Health thought the request unnecessary. The BBF was accused by one of the foreign coordinating centers as having lied about the initial request because the center was simply unaware of the facts.

These and dozens of petty squabbles which do not include BBF are symptomatic of a situation in which there are many interacting organizations whose staff members may be individually on the verge of collapse or hypercharged emotionally. They represent deficiencies which are very desirable to minimize in the future.

Further, understanding the enormity of the task, some foreign coordinating agencies attempted to restrict the number of relief agencies involved so as to reduce the overall work load. While the attempt to consolidate is at times desirable, it can lead to the exclusion of millions of dollars worth of valuable resources from the disaster area. Most agencies have their own cultivated constituencies, governmental and private. Efforts to overtly force a consolidation may disillusion them and significantly reduce or even end all disaster relief support in the future from these sources.

Controlled Solicitation

Once some sense of general direction of relief activity is established, it becomes necessary to collect the required resources with maximum speed. Funds are naturally a top priority because of the flexibility of their use.

Appeals for gifts-in-kind, whether labor, medical, construction, or material come second and must be carefully screened as to their value and suitability in the disaster area.

The most mentioned gifts-in-kind in a sudden disaster relief are medical supplies. There is a

great tendency on the part of many agencies to send all types of medical supplies as quickly as possible. Unfortunately, many of these supplies are outdated, unnecessary, damaged in shipment, already available or unmarked.

Given the fluid situation and 100 or more autonomous agencies involved in Guatemala, it is easy to see how supplies were needed one day and not needed the next. However, that is not to say that these duplicated supplies are without value since, when possible, they were sorted and put in storage until possibly needed at a later time. Because Guatemala is a relatively advanced third world country, the NEC was able to assign a number of pharmacy students to sort and label supplies.

The BBF sought to assure the quality of and necessity for all items it collected, purchased and sent to Guatemala. BBF therefore inspected all medical supplies before shipment, using only pharmaceutical houses and major distributors as sources. Furthermore, the BBF insisted that the Ministry of Health examine the lists of available supplies and make written requests for needed items.

Aside from the actual solicitation, the BBF encountered some problems of actually holding on to company supply commitments which had been already made. For example, two companies offered to BBF, in writing, over $ 110,000 worth of medical supplies and vegetable seeds, which the Ministry of Health and REC accepted immediately if delivery could occur within the next three months. The BBF immediately informed the companies about the acceptance but when plans for transportation were made, some two months later, both companies failed to honor their offer, explaining it as a misunderstanding. In fact, one of the companies had sold all of the proposed donation in the interim.

Transportation Logistics

Once requested supplies or human skills are obtained, it is essential to deliver these resources at the optimal time.

BBF and many other relief agencies encountered tremendous supply transportation problems by sea, land, and air. Ocean delays were often as long as six weeks once the material had arrived in port of entry because severe quake damage was done to Guatemalan port facilities and road systems. Air shipments were delayed by as much as two weeks, even though cargo capacity was increased by the use of aircraft from 30 countries [4].

Internal Control and Mobilization

As resources became available to the BBF, it was essential to expand both its administrative staff and information flow for the duration (February 4–March 4, 1976) of the acute crisis.

BBF utilized the services of 20 part-time volunteer clerical workers, who processed as many as 600 contributions a day (up from the normal 3 to 5 contributions a day) and handled in excess of 200 telephone calls a day.

Beyond the monitoring of potential donations of gifts-in-kind previously mentioned, the BBF staff had to keep updating its inventory lists and logistics reports continuously so that staff and trustees of the Foundation would be in a position to make appropriate, accurate, and timely decisions.

Periodic Review and Planning

Periodic program reviews with planning recommendations by disaster relief agencies and their authoritative peers (governmental, private, news media, etc.) are essential if such agencies are to continue to improve their performance levels and learn from experience. Unfortunately, many agencies fear that such evaluations might prove harsh, especially if the evaluators are in some sense competitors. At the same time, many outside observers are concerned that self-evaluation or evaluation by peer authorities would amount to veneer praises and not identify, or be able to cope with, obvious errors.

RECOMMENDATIONS

If there is an international appeal for assistance it is preferable that a single governmental agency within the disaster country provide the necessary coordination. Unfortunately, the scope of the disaster may be so monumental that the limited managerial resources of a given third world country may not suffice, forcing other agencies, both domestic and foreign, to join the coordinating effort. BBF, therefore, submits a series of broad, relatively simple recommendations for consideration by all agencies with potential involvement in third world countries.

Information and Coordination

(1) Disaster relief organizations must expand their reporting capacities to include all legitimate coordinating agencies so as to minimize duplication and misunderstanding.

(2) The number of coordinating (in-country as well as foreign) agencies should be reduced or at least specialized so as to minimize unnecessary duplication and misunderstanding.

This specialization might be done by designating an agency or sub-agency to deal with an area of particular interest (i.e. medical, reconstruction, loans, etc.), geographic area (i.e. Organization of African States might be responsible for coordination of resources from Africa) or type of institution (i.e., private, international, governmental, etc.) or any combination thereof.

(3) The smaller agencies must be in a position where they are allowed to discuss the pros and cons of each disaster country's request with the foreign coordinating agencies without the fear of arbitrary interference from the foreign coordinator. Otherwise, the smaller agencies may feel forced to withdraw valuable resources from volunteer participation.

(4) Coordinating agencies should be better able and willing to advise and, if necessary, assist the smaller, newer, less known and legitimate agencies.

(5) All coordinating and relief agencies must admit the possibility of error and misconception, and approach each disaster as a different learning situation where past experiences apply in varying degrees.

Controlled Solicitations

(1) Relief agencies should develop and maintain quality control checks on solicited or purchased supplies and personnel so as to prevent unnecessary and costly deliveries.

(2) Relief agencies should review the necessity of prospective purchased and donated supplies before final acceptance is made because of changing needs in a disaster situation.

Transportation and Logistics

(1) Smaller relief agencies should maintain close contact with some of the more experienced foreign coordinating agencies and/or disaster coordination agencies within the stricken country regarding reliable transportation routes.

(2) Foreign coordinating agencies should not interfere with effective transportation and target delivery arrangements made by the relief agencies unless they show legitimate cause and fully explain their actions to all concerned parties, including the disaster country's coordinating agency.

Periodic Review and Planning

(1) Relief agencies should establish a policy of written self-reviews of disaster response within six to eight months of the time of initial involvement.

(2) Such agencies should continue to request on-the-spot oral and written evaluations from authoritative peers and staff members during the crisis period.

(3) Disaster relief agencies should be willing to share review reports with all interested parties whether in a private or public forum, so as to provide more insight.

(4) All agencies should formulate realistic self-review criteria from which positive recommendations and changes could be made.

NOTES

1 Such a program may have psychological benefits for the refugees since it would be a relatively quick and inexpensive demonstration of the government's concern.
2 The collapsing walls and falling tiles were by all estimates the main cause of death and injuries in the disaster area.
3 San Pedro is the flower capital of Guatemala and many of its farmers grow flowers commercially.
4 Because of the backlog of donated supplies from all sources, in February 1976 Guatemala received over 4,000,000 pounds of supplies by air compared with a normal capacity of under 300,000 pounds per month.

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A PHILOSOPHY OF PRECAUTIONARY PLANNING

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Planning is a policy activity which sets its objectives in the form of targets to be reached in a determined time. Targets established by the plan must be feasible in terms of available resources if any success is to be achieved. Planning can be attempted at varying scales from the international, through the national and regional, to the local level. In this paper, we shall concentrate on one aspect of planning, namely, precautionary planning. The phenomenon of precautionary planning is relatively recent and we shall argue that it must assume a role of increasing importance within a framework of development planning.

During 1973, twenty-five large-scale disasters were recorded in which more than one hundred thousand people were killed and over 215 million lives were disrupted (USAID, 1974). The total value of assistance for these twenty-five disasters exceeded one billion dollars, but more than 60 per cent of the assistance was in-country self-help. To give a sense of the scale of this aid, ninety-three countries of the world had less than this amount of resource capital during 1973 (World Bank, 1974).

The cost of disasters and their increasing frequency, particularly in underdeveloped countries, prompts one to ask the question of what can be done. Can one develop a philosophy that will enable a more rational approach to disaster occurrence? On the basis of that philosophy, can one develop a method which can successfully mitigate the conditions associated with disaster? To successfully mitigate the effects of disaster, it is obviously necessary to be prepared for an eventual disaster strike and to prepare plans for such a disaster strike; this activity is termed *precautionary planning for natural disaster*, and is a relatively recent phenomenon. It is only since 1970 that attention has begun to focus on pre-planning at all, but the major part of any interest in disaster situations is still relief (Lewis, 1975a). The recurrent and increasing costs of disasters would seem to indicate that there could be a more efficient way of using capital than merely providing relief: complementary precautionary planning would seem an obvious practical approach. In any case, it has already been indicated that relief aid can frequently reinforce the conditions of vulnerability associated with disaster-proneness (Baird et al., 1975).

Disaster must be seen not as a single isolated event but as one stage in a dynamic ecological relationship (Westgate, 1975). Disaster is the interface between an extreme physical event and a vulnerable population. The increasing number of disaster occurrences observed in the world is attributable not to an increase in the probability of the physical event but to the increased vulnerability of the human population (Baird et al., 1975). It has been shown that

over 60 per cent of the costs for disaster relief are borne by in-country self-help; the proportion of in-country self-help increases during the periods of rehabilitation and reconstruction. These costs underscore the necessity of some form of indigenous precautionary planning which, as the cause of disaster can be shown to be social as much as physical, should be orientated towards the social and economic conditions in which a population exists.

The most common approach to precautionary planning is the administrative logistical approach. This approach is currently favoured by most authorities and concentrates on the disaster strike, evacuation and relief. The same plans are often used for both natural and man-made disasters, for hurricanes and civil disturbance. The orientation is towards practicality immediately before and after a disaster strike. This orientation is summarised by the United States' Office of Emergency Preparedness:

> It is important that government emergency response to natural disasters be accomplished through the existing organizational arrangements augmented as necessary. This approach should result in greater identification of government officials with their constituencies during times of extraordinary need. It is a logical extension of governments' dealings with day to day emergencies.
>
> (1) to expand routine emergency services such as police, firefighting and sanitation;
>
> (2) to provide those things which the individual citizen takes care of by himself in normal times but which have been interrupted by disaster such as food, housing and personal welfare;
>
> (3) to make special provisions for medical care.
>
> (US Office of Emergency Preparedness, 1972)

There is great need for such an action plan but it should be seen as part of a wider program of precautionary planning. The concentration on administrative measures to alleviate conditions immediately after the disaster strike does not treat disaster as a dynamic situation resulting from resource utilization in a hazardous area. As such it is myopic, often treating the symptoms but not the causes of disaster.

The results of this administrative approach have also often tended to concentrate on the efficiency of the system rather more than on the flexibility to cope with the multifarious requirements of victims in a variety of unknown situations. The results of systems analysis have been rigidly applied, often it would seem for their own sake in achieving a co-ordination of sectors and services, instead of designing these services to attend to an analysis and assessment of social needs.

If there is a favourable cost-benefit ratio for short-term plans in taking early measures when disaster is imminent, how much greater will be the cost-benefit ratio of taking long-term ameliorative action? Preparatory action taken against spring floods in the USA (Operation Foresight, 1969) had an estimated 10 : 1 benefit-cost ratio (US Office of Emergency Preparedness, 1972). The general ratio of sustained losses per single disaster event to the costs of prevention is 1 : 13. Burton et al. (1976) graph the ratio of all damage loss to adjustment expenditure. The ratios vary between approximately 1 : 1 for drought to 15 : 1 for hurricanes. All this data is based on the US experience, for little work has been done in the rest of the world, but there is little reason to doubt that substantial capital expense following disasters could be avoided if precautionary planning were to be implemented.

The Disaster Research Center at Ohio State University concentrates on sociological analysis of specific disaster situations; the Disaster Research Center's perspective on predisaster planning reflects this research orientation. Underlining this approach are a number of planning principles, namely:

a. Planning is a continuous process – written plans are only a small part of the total planning process.
b. Planning involves attempting to reduce the unknown in a problematical situation.
c. Planning aims at evoking appropriate actions – the *impulsive* action must not override that which is appropriate to the situation.
d. Planning should be based on what is likely to happen – the realistic approach is to plan according to how people will react and not plan and hope that people will conform to the plan.

e. Planning must be based on knowledge – actual observed behaviour in disaster is imperative to any realistic plan.
f. Planning should focus on principles – simplicity is the key to successful disaster planning.
g. Planning is partly an educational activity – educational not merely for the general populace but for the planners and administrators as well.
h. Planning always has to overcome resistance – there will always be sections of the population who believe they are in no danger. (Dynes et al., 1972)

Many of these principles may seem obvious, but that is a prerequisite for achieving implementation, and to state these principles brings them into the realm of the consciousness. Latent awareness of a particular situation often promotes latent action.

From each of the areas of study, certain elements are stressed as being important for the disaster planner. From the nature of disaster agents the following characteristics emerge: predictability, frequency, controllability, speed of onset, length of forewarning, duration of impact, scope of impact and intensity of impact. It is suggested that the disaster planner should have knowledge of these characteristics. Similarly, disaster promotes distinct areas of organisation and related tasks: warning, pre-impact preparations, search and rescue, care of injured and dead, welfare, restoration of community services, protection against continuing threat, and community order (all demands which are generated by the disaster agent); communication, continuing assessment of the emergency situation, the mobilization of human and material resources, co-ordination, and control and authority (all demands generated by a community's response to the disaster agent).

The changes required in normal organisational structure in order to accommodate the new extreme situation lead to new sets of tasks for which mobilization of resources is necessary but under conditions which must be understood to be uncertain, urgent, promoting an emergency consensus, expanding the role of citizens, convergent and de-emphasising of contractual and impersonal relationships. The way a community organises itself in times of disaster is expressed in terms of organisational domain, organisational tasks, organised activities and human and material resources.

These areas of study provide the material for the planner and must be coordinated in planning. The planning priorities are delimited among various organisational domains which have distinct responsibilities which are not necessarily mutually exclusive. These various domains are organised into tasks and the tasks into sub-tasks, etc. An important part of any planning framework must consider the performance of these tasks and the relationships between the various organisations.

The Disaster Research Center approach is essentially a sociological one. It is concerned with the co-ordination of community activity based on an understanding of that community's response to a particular disaster event – the periods immediately before, during and immediately after a disaster impact. The Disaster Research Center's approach to precautionary planning is a short-term one operating for as long as impact characteristics last; it pays no concern to the disaster process – the hazard environment (Baird et al., 1975). Such a planning approach has little relevance for the underdeveloped countries where many of the organisational facets of society required by this approach are non-existent.

A regional planning approach is best illustrated by the work of Krimgold (Krimgold, 1974). Krimgold argued that it was in the pre-disaster phase that investment of effort and resources would give the greatest returns in human and economic terms and that planners have an important part to play in this phase. Recognising the significant increase in recent years in the amount of aid provided as disaster relief by developed countries, Krimgold argued that this aid is only of a temporary and curative

nature. It does not provide protection and does not prevent the occurrence of the disaster. What is required is for attention to be focused on mitigative aspects and perhaps prevention. 'Predisaster' planning must be seen, particularly in underdeveloped countries, as a development priority.

Krimgold sees predisaster planning as being most effective when applied to the disaster process, the long-term situation. Relief aid is not adequate if the purpose is the alleviation of human suffering. As development aid has repeatedly failed in underdeveloped countries, more emphasis has been placed on relief aid – a palliative, not a cure to disaster vulnerability.

Krimgold argues that the emphasis must be pulled away from relief aid to predisaster planning, which will include relief aid but only as part of the whole predisaster planning procedure. Predisaster planning includes disaster mitigation (which Krimgold refers to as principally land use zoning and building codes) and disaster prevention and must be contained within development planning and seen to be a priority in those countries with a vulnerable population.

The regional planning approach is not without its difficulties. Economists and geographers in the USA analysed water resource investment, particularly in flood control, irrigation, navigation and power generation within a framework of regional planning. One starting point for their analysis was the interest rate used for justifying public works in water development, contrasting the new public rates against the so-called 'social opportunity costs' and the private rates of return for investment and saving.

> Artificial low interest rates, it was argued, lead to a distortion of the investment pattern, providing larger amounts of flood control or drought control (in the form of irrigation) than was justified by a rational appraisal of the benefits and costs. This, in turn, led to a favouring of large technological projects over alternative hazard adjustments. This initial critique was followed by an outpouring of research effort and subsequent refinement of the economic distortion argument. Neoclassical economists argued for minimal government intervention and for allowing the market processes to lead to more sensitive assessments of risk by individuals and firms. Welfare economists argued for improved public procedure for resource allocation (Kates, 1976).

Such a debate indicates that even with a regional planning approach the problem of integration remains paramount. This necessitates a multidisciplinary approach but the multidisciplinary approach must develop into an interdisciplinary one to allow effective planning.

Both the sociological and regional planning approaches outlined are an inadequate base for planning because they adopt a single factor approach to the problem. The complex reality of disaster can only be adequately understood within an interdisciplinary approach. The Disaster Research Unit at the University of Bradford has attempted to develop such an approach and studies have been conducted on this basis.

The Disaster Research Unit argues that local resource utilization is an important part of any attempt at planning within an underdeveloped country. Indigenous resources are defined as everything present within a particular locality and includes infrastructural and administrative elements.

Precautionary planning was originally seen

> . . . as a comprehensive precautionary strategy ranging from administrative contingency planning, strengthening of buildings and revision of building codes, flood plain control and land use zoning to the technology of warning systems and psychology of response to them. These precautions will be prepared for a known vulnerability and analysed risk. Furthermore, the economic impact of natural disaster events can be explored (and their role in a condition of low development examined) in an assessment of losses from past disasters and a forecast of probable future losses (Lewis, 1975b).

This view is still the keystone of the Disaster Research Unit's philosophy, but with further field experience, planning implementation and academic research the expresssion of the view has been considerably amplified. With the certain knowledge that disasters are increasing, especially in underdeveloped countries, and that the explanation of this phenomenon lies not in an increase in the probability of the

physical event but in the increased proneness of human populations to the vagaries of the environment, a more comprehensive precautionary planning strategy was designed (Baird et al., 1975). This strategy is outlined in *A Study in Predisaster Planning* and *A Primer of Precautionary Planning for Natural Disaster* (Lewis, 1975c; Lewis, 1977).

The basic orientation of the strategy is to recognise that disaster proneness is associated with underdevelopment. Logically, therefore, it would seem that precautionary planning should be associated with development planning. Precautionary planning should be seen as the insurance mechanism in the development planning process. It is important to realise the interrelationship between disaster and development. A recent publication outlined this relationship as follows:

> Perhaps the most thought-provoking idea of all is that just as natural processes such as environment affect social structure, so social process such as economic development can affect natural systems "causing" famine and soil erosion for example. This should make us think again about the term "natural" disaster (Richards, 1975).

The paradox presented by such an analysis is obvious. Does the planner concentrate resources exclusively on long-term development strategies which would reduce the proneness of a population to hazard but forego the relief needs which will occur after the inevitable disaster, or does the planner concentrate on relief activities encouraging a further dependency which will inevitably make a population more prone to disaster? The general tendency is to place too much emphasis on relief and little emphasis on precautionary planning (Livingstone, 1975). In each situation, the emphasis will change, but there is evidence to show that in terms of cost-effectiveness emphasis should be placed on precautionary planning (White and Haas, 1975). There are two major contradictions in planning method. The first has already been mentioned, namely, the question of the way in which planning can be achieved, particularly when the target is long-range. In any system similar to the democracies of the developed world, potential governments win popular elections by indicating their achievements or the failings of their opponents. Because elections occur frequently potential governments concentrate on short-term success and tend to disguise long-term planning. The second contradiction also relates to the political process, namely how can collective interests which the plan should consider be reconciled with individual interests.

Given that precautionary planning is more cost-effective in disaster-prone areas than relief and that monofactor approaches to the problem are less beneficial than interdisciplinary ones, it is important to outline the framework of expertise required by a precautionary planning team (Disaster Research Unit, 1975).

The orientation of precautionary planning will be divided into three parts:

a. policy
b. strategic planning
c. detailed planning.

Initially it is necessary for governments and other institutions to become aware of the possibilities of precautionary planning. When this awareness is current then it is possible to produce a strategic plan, but the detailed precautionary planning is the realm of the indigenous planning core.

The history of the Disaster Research Unit at the University of Bradford indicates an amplified view of the nature of precautionary planning. Initially a framework for research was divided into three areas: the risk of natural hazard; the economic impact of hazard; and forms of precautionary planning. With further experience from actual research and application, the scope of the Unit has been reinforced and the increasing demand for the application of the Unit's work is clear expression of the need.

Precautionary planning must rest upon the body of knowledge contained within the physical and social sciences. There must be information available about the nature of natural hazards and techniques to prevent their impact. Monitoring systems and forecasting methods

for a variety of natural hazards should also be included. There is little point in duplicating research work in the physical sciences on the nature and prevention of natural phenomenon but it is imperative that there be a clear understanding of the nature of the work. From the social sciences, it is necessary to compile statistics of disaster occurrence and disaster losses, to study the effect of losses on the national economy and the relationship between disaster and development. Most importantly, the cost of relief should be calculated so that it can be compared with the capital cost of precautionary planning expenditure.

With such a theoretical base of knowledge, it is possible to consider a specific location with a view to formulating precautionary plans. For a specific location it is necessary to estimate the vulnerability to a specific disaster impact. For each disaster type it is necessary to know the intensity of the physical event and the risk, the perjorative probability. Similarly, it is necessary to understand the physical and social proneness of a population to a disaster situation. This is achieved by undertaking a detailed analysis of the prevailing social and economic conditions in the specific location.

The data gathered and subsequent analysis after research into the disaster context provides material for the preparation for precautionary planning. Precautionary planning is divided into three sectors, namely, physical precautions, social precautions and contingency planning. Physical precautions include land-use zoning, building construction codes and practice. Social precautions include the preparation and promulgation of warnings, training, education and public information. Contingency planning considers the use of indigenous resources, problems of logistics, emergency organisations and sectoral plans.

Planning is essentially a continuous process and implementation is its code word. It is imperative that the planning be implemented and not exist solely as a document to be kept in a bottom drawer for emergencies. The implementation of the Bahamas Predisaster Plan (Lewis, 1975c) has rightly been regarded as an integral part of the planning process and of the overall project which is continuing. It is important that some feedback mechanism exists so that modifications can be introduced over time paralleling change in the specific disaster context. Planning implemetation obviously has short, medium and long-term stages. However, because planning is within a dynamic framework, allocation of implementation to each stage varies as implementation proceeds. Thus, the short-term is under continual review, and implementation of the long-term is coincidental with the implementation of the short or medium-term stages.

Planning is an activity in the present for the future. It is crucial to any plan to know what timescale is envisaged. Precautionary planning, like development planning, is essentially a long-range planning activity; the aim of precautionary planning is to reduce the proneness of a population to a hazard and this is achieved by relieving the existing social and economic conditions. The aim is similar to that of development planning, i.e., increasing human welfare and thus the ability to absorb disaster effects. This is the grand design, however, which is useless without practical application. Medium-term measures such as land-use zoning are necessary to reduce vulnerability to hazard – these measures decrease the effects of disaster. The short-term measures are those associated with relief work necessary after a disaster strike.

The following can be said to be the phases of the pre-planning process grouped on either side of a line representing the disaster event itself; the first three phases applying to time before the event and the last three phases to periods of time after the event. (Whilst pre-planning for a single disaster event can, by its nature, only take place before that event, the opportunity to pre-plan for subsequent events will be in the last two phases after the single event.)

The purpose of precautionary planning at a practical level accepts that a disaster is likely to occur and in any case the total *prevention* of disaster calls for the prevention of the causative

Prevention
Precautions for mitigation – physical precautions: within building and planning/land-use zoning
Precautions for warning – social precautions: warnings and associated advice

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Emergency – during and immediately after the disaster event
Rehabilitation – emergency housing and provision of food and water
Reconstruction – rebuilding and reconnection of utilities and services.

natural phenomena, calling upon expertise, technology and resources beyond the capacity of the majority of disaster-prone countries. It is perhaps an aspect of precautionary planning that belongs to an international level and a distant future.

Pre-planning for reconstruction might appear to be an exercise beyond the scope of this subject except that clearly the provision of permanent building and supporting services and utilities must take account of the possibility of a future disaster. In fact, processes belonging to reconstruction will take place whether or not there has been a disaster and the needs of precautionary planning must be incorporated. These activities belong to what is generally called 'development' and it is illogical for the processes of development to ignore probable damaging effects of disaster.

The essence of precautionary planning, therefore, in any practical context are the phases of:

Precautions – physical and social

Emergency
Rehabilitation

Of these three phases the latter two depend entirely on what happens during the disaster itself and can be covered in short-term precautionary planning only by *contingency planning* – the identification and preparation of a range of aids to decision-making during and immediately after the disaster event. Long-term precautionary planning will be incorporated in the rehabilitation phase.

The disaster event itself may, in the extent or severity of its impact, be: *national*, *regional* or *local*. Here we are not referring to administrative concern, involvement or action, but to the comparative extent or severity of destruction and losses in the overall context of the country in which the event has occurred. Variations in the degree of severity may be due to variations in size or intensity of one type of event, the area of territory affected by an event or smaller and localised disaster events. Variation of these kinds may affect communities by depriving people of their *immediate bodily needs*, needs such as potable water and edible food or of less immediate but equally essential needs of *social organisation* such as simple shelter, warmth and sanitation. A third category may be affected by the more violent of disaster events where the *physical infrastructure* of a community on which life has come to depend is disrupted causing loss of permanent housing, services and utilities (water, gas, electricity) and transportation, and the more complex life support systems within an industrial infrastructure.

Precautions themselves can now be expanded and considered in *either* the:

Short-term:	social precautions – warnings
Medium-term:	physical precautions – land use zoning and construction
Long-term:	development

depending on resources and expertise available, but all precautions being taken as those actions which are possible at a given time for application for a future span of time from that point. In other words, these are *not phases for future action*. Through their application in development, long-term precautions should automatically involve reconstruction after a disaster event. Contingency plans and precautionary plans may be prepared at a number of 'levels' such as government and non-government (and sectoral plans within each of these) and each of these plans will examine disaster with the same kind of analysis and with the same kind of division and tabulation. They will be co-ordinated by the 'highest' level, i.e. government, within the national disaster plan.

There are therefore two principal headings for activity within the precautionary planning process:

Precautions, and
Contingency planning.

Note that the line denoting the disaster event has now been omitted as these are now activity headings within the precautionary planning process itself; this is an integrated simultaneous process, and the time sequence on which the original disaster phases were based (from which the precautionary planning activities took their description) becomes irrelevant. Contingency planning will be considered first.

Contingency planning is required to predetermine a group of actions and activities of unknown number, sequence and magnitude, but all of known likelihood in a disaster event. These activities can be broken down into the following areas of application:

National, regional and local areas of application.
Government and non-governmental areas of responsibility.

All, or almost all, contingency planning activities will concern areas of application, the area of effect being the principal difference between them.

Governmental and non-governmental areas of responsibility produce the essential and most significant classification in practice, but as it is likely that within their respective area of responsibility both sectors will follow a similar activity pattern, it is useful to consider further sub-classifications.

For this purpose a re-examination of the origins of the contingency planning heading is useful and reveals the dual source of 'emergency' and 'rehabilitation'. For even further ease of identification and definition the 'emergency' phase has been divided into 'emergency' and 'relief' phases to produce now the headings for contingency planning activities of *emergency*, *relief* and *rehabilitation* where 'emergency' is the period *immediately before* the disaster event if any warning has been possible (for practical purposes in this context the disaster commences on receipt of warning), *during* the disaster event and *immediately afterwards*; and where relief is the period of easing the state of suffering and distress, and rehabilitation is the re-connection of dislocated services, utilities and shelter. These headings could be alternatively and simply, short, medium and long-term contingencies.

The other of the two principal headings for the precautionary planning process is 'precautions', which has already had its first or primary classification on the basis of mitigation and warning or 'physical precautions' and 'social precautions'. These two sub-headings can be taken separately and further sub-divided for practical purposes. Actual physical precautions against natural disaster and encouragement given to individuals to take physical precautions are seen as belonging totally to the government sector. There is therefore no practical purpose to be achieved by applying the government/non-government classification. On the other hand this is the heading under which there may be precautions involving considerable expense and therefore the differences of time scale are seen as being the most significant activity division. Long, medium and short-term precautions may then be identified by or allocated to national, regional or local competence.

Social precautions are based on 'warning' and clearly any warning system must only emanate from a single controlling source. The resources and responsibility for that source are governmental and the governmental/non-governmental division becomes the most significant classification, some of the related activities belonging to the non-governmental area of responsibility. Warnings themselves will be given on a national basis even where they may be regional or local in effect and by their nature are short-term, but again some of the related activities may be classified into national, regional or local areas of competence.

The complete implementation of this total framework for precautionary planning relies, in the first instance, on an awareness of the total precautionary planning process by governments. With a concept which is in its infancy in research terms, it is unlikely that governments will be even aware of research activity and least

of all of the results of that research. This is not to be derogatory of governments – it is the normal process perhaps – but the first step in implementation is to promulgate information of research activity and its results.

When it does take place, implementation in the form of projects of precautionary planning is likely to be fragmented and piecemeal, but if these projects are undertaken within an awareness of the total concept little will be lost. There is after all a sheer manpower problem in the undertaking of projects so all-embracing as to be capable of implementing the total framework. For instance, a pilot study in the Windward Islands has examined the effects of hurricane and drought on the production of bananas, the principal commercial activity of St. Lucia and St. Vincent (O'Keefe, 1975). Another pilot study has set out to examine the feasibility of and management for a regional disaster fund set up by nine (now ten) countries of the South Pacific (Lewis, 1976). Neither of these projects, both of considerable size and extent, embrace the total concept of precautionary planning but both have achieved considerable impetus and support from being considered within a total theoretical strategy of precautionary planning for natural disaster.

Furthermore, if the need for planning is accepted and therefore if the need for precautionary planning is obvious (as has been demonstrated by the demand placed on the Disaster Research Unit), the approach to precautionary planning must be to incorporate it within a development planning framework. Such an incorporation would mean that development planners could conceive the risk involved in development programmes but more importantly that the infant applied science of precautionary planning could avoid the pitfalls experienced by development planning. The ethnocentric approach of planners, the willingness to transfer Western models of planning and technology to often wholly inappropriate environments can be avoided. Monofactor orientations will be avoided because of the interdisciplinary nature of the exercise. Planning can be implemented with the people, not merely for the people, by an acceptance of grassroots participation in the planning and implementation stages. Such a strategy as outlined will produce a safer world.

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SOCIAL INTEGRATION AMONG DISASTER RELIEF VOLUNTEERS: A SURVEY*

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Introduction

The successive years of drought (1968–74) in the Sahel in West Africa gave rise to a famine situation (see Seaman et al., 1973; Greene, 1974; Kloth et al., 1976).** In view of the emergency, in May 1974 a joint medico-nutritional program was set up by the government of the Republic of Niger, the League of Red Cross Societies and the United Nations Development Program.

This program included the formation of ten medico-nutritional teams established in the camps giving refuge to the victims. Some 80 European and North American volunteers, most often recruited by their national Red Cross Societies, worked for periods of varying length. The actual time spent in Niger varied from 7 to 37 weeks. The onset of the rains brought an improvement in nutritional conditions shortly after the beginning of the program, changing the epidemiological picture and imposing far-reaching readjustments on the part of those responsible for the program and the volunteers. The general opinion of the beneficiaries and the local authorities was that the results of the operation were largely positive. Nevertheless, because of the problems arising through the large-scale use of foreign volunteers, the Red Cross initiated a detailed inquiry into the degree of integration of volunteers in a medico-nutritional program calling for special qualifications.

The study was carried out by the Research Center in Disaster Epidemiology at the University of Louvain (Brussels, Belgium). Among the data and materials obtained were:

- 30 end-of-mission reports drafted in Niger by various delegates;
- 57 anonymous questionnaires filled out several months after the end of the program (this number represented 77 percent of the 74 volunteers contacted);
- an evaluation report on each delegate prepared by the heads of mission;

*This study was supported by a grant from the League of Red Cross Societies in Geneva. A version of this paper was presented at an informal meeting of disaster researchers in Paris, France, July 26, 1976

**Editor's Note: The drought affected 23 million people in Chad, Mali, Mauritania, Niger, Senegal and Upper Volta. Niger, upon which this article focusses, experienced catastrophic difficulties: 1.6 million people were severely affected; the refugee camps discussed here served as many as 250,000 displaced persons.

– an overall technical report also drafted by those responsible for the program in the field.

In the end-of-mission reports, the delegates were asked to express, informally and without constraint, their opinion on a series of themes. Written while the volunteers were in the midst of the field activities, these carry an important emotional component. The questionnaires involved a number of open and closed multiple-choice questions. The official reports by mission heads included both an expression of their own opinions and a retracing of the development and the climate of the operations. In addition, the interpretation of some results called for direct observation by some of the authors of this article who actively participated in the medico-nutritional program.

FINDINGS

The responses to the questionnaire reflect the great diversity of the volunteers. Volunteers came from ten countries, with more than ten percent each from Norway, United Kingdom, Belgium, Switzerland and Canada. While para-medical workers made up 35 percent of the volunteers, physicians 14 percent and nutritionists 8 percent, more than 40 percent of the volunteers were without qualification in the medico-nutritional field. The latter category included mostly personnel from the tertiary sector – administrators, teachers, social workers, etc. A majority of the volunteers had no prior experience in developing countries. In fact, only 14 percent had two or more years of experience. Furthermore, only 15 volunteers had had prior exposure to Black Africa. Volunteers were as a whole rather young (81 percent between 22 and 35 years old, of whom 28 percent were less than 26 years old). Seventy-five percent of the volunteers were unmarried, which is a high proportion compared to the corresponding age category in a normal population.

These characteristics of the volunteers were used to analyze the questionnaire data and other materials along four dimensions involved in social integration: personality, motivation, qualification and communication.

PERSONALITY

One very clear constant becomes evident from the many correlations between the various items of the questionnaire. It is that the types of opinion were almost never significantly associated with professional background, nationality, sex, age or any given degree of previous experience.

On the other hand, end-of-mission reports supported the view of those who believed in the capital importance of the personal psychological components of the volunteers. Singled out was the immaturity of many volunteers, regardless of age, as well as temperament, excessive individualism and a "St. Bernard" tendency. Virtually all the volunteers declared themselves desirous of pursuing a similar experience in identical conditions. But in their final evaluation, mission heads thought that more than half of the personnel should be refused for future similar activities.

This suggests the necessity for having recourse to selection by appropriate means (test, interview, etc.) perhaps derived from models for military selection. Of course, an emergency created by drought differs considerably from the classic catastrophe situation. The latter often arises suddenly, and it is virtually impossible to select volunteers in such cases (Barton, 1969). It is equally important for relief organizations to retain contact with the most valuable elements capable of establishing the bases of later missions. Our study has shown that recruitment takes place above all through personal contacts based upon professional and individual affinities. Recourse to the mass media appears to be of little importance.

MOTIVATION

The problem of motivation is many-sided. Volunteers were questioned on their motivation by means of a closed question mentioning four not reciprocally exclusive items: professional interest, idealism, spirit of adventure, and money. Eighty percent of the respondents mentioned professional interest; fifty percent mentioned professional interest exclusively. Twelve percent cited idealism exclusively and 40 percent mentioned it in combination with others. Four percent admitted to having been motivated by adventure only, but to this 30 percent added one or the other of the beforementioned motivations. A single answer mentioned monetary gain in association with other motivations.

Neither professional background nor nationality seemed to play a determining role in the motivation claimed, nor did experience. At the most, the attraction of adventure was admitted to slightly more often by the inexperienced. It seems, however, that the search for adventure was more often present and stronger than was admitted to in the answers. Virtually all the volunteers declared themselves ready to participate in a strictly similar action, although half of them denied any short-term beneficial result from the program and half of the professionally motivated members considered that their skills had been used only occasionally.

Hypertrophy of the idealistic motivation has sometimes proved to be a source of difficulty in the field, as already mentioned. It might be pointed out that the purely "charity" approach is, at the present time, questioned, both by the relief organizations and the beneficiaries. At the individual level it seems, wrongly, to be closely associated with the notion of voluntary service. This has been stigmatised by some of those responsible for the program who would prefer at least part of the personnel to be "professional" and paid as such. This preference is obviously based on the observation of marginal cases of maladaptation to this type of mission. The absence of rewarding situations has indeed been discouraging to some persons (feeling of uselessness) or – on the contrary – it has led to misplaced initiatives (ill-considered distributions of foodstuffs and medicines or a policy of medical care contrary to instructions). In Niger this phenomenon was exacerbated by the circumstances: recruited for a situation of acute nutritional distress, some volunteers arrived when, due to unexpected rains, the essential tasks had been reduced to those of alimentary rehabilitation.

QUALIFICATION

The original aims of the operation demanded a high proportion of participation by health and nutrition technicians (physicians, nurses, nutritionists) assisted by unqualified volunteers. Problems arose from the relative over-qualification of those involved.

Over-Qualification at Group Level

By unanimous opinion, there were too many foreign volunteers, particularly since the autochtonous participation was found to be of excellent quality having the huge advantage of cultural identity with the human and environmental scene. The foreign volunteers felt that part of the work they carried out (minor treatments, driving vehicles) could have been entrusted to the Niger personnel, and that this large proportion of foreigners was sometimes a hindrance as regards cohesion.

Individual Over-Qualification

Half of the technicians (notably physicians) had a very negative feeling about the too reduced or too occasional use they considered to have been made of their skills. Reactions of disillusionment and disheartened passivity, or else imprudent initiatives, expressed the

incapacity to adopt a rational attitude towards the preconceived role and the conditions established beforehand in a European and North American context.

Finally, qualifications seem to lead to the claim for a more equitable and bilateral participation in decision-making (among others, the discussion of aims and means of action). Some of those responsible in the field, inclined to favour organisation of an authoritative type, considered this to be an operational hindrance.

COMMUNICATION

Most of the problems of personality, motivation or over-qualification were expressed at the level of social communication. This communication, already damaged by technical factors (distances, insufficient means of telecommunications, language problems, movements of personnel at all levels), was complicated by distortions within the teams and a certain opposition to the direction based in the capital. The heads were very often regarded as outsiders to action in the field ("city dwellers"), or as being frankly undesirable in the eyes of individualists, idealists and disappointed professionals. This is expressed, among other ways, by the unflattering opinion of the information transmitted by the leaders: briefings, in-mission communications, visits in the field. Fifty-nine percent of the volunteers had a poor general opinion about the previous briefings in the capital. The in-mission information received from, for instance, the head-delegate was frequently regarded as either "excessive" (11 percent) or "insufficient" (40 percent) or "non-existent" (11 percent). Similar patterns were found in the volunteers' assessment of medical coordination. End-of-mission reports sometimes express the feeling that the leaders did not know local problems and hindered the teams' actions. This situation of conflict between the "field" and those responsible in the capital arose very frequently during relief operations.

CONCLUSIONS

The aim of this study is to draw attention to a particular type of situation arising in disaster relief. Volunteers in prolonged nutritional aid operations seemed to fall halfway between, on the one hand, the "classic" rescue workers implicated more personally in the disasters and, on the other hand, the health-service staff participating in long-term development programs. The sometimes ambiguous mixture of motivations of idealism, professionalism and adventure has created a special psychological and sociological context to which some persons (both volunteers and leaders) have shown themselves to be little adaptable. Further studies are necessary in order to evaluate in terms of efficiency the advantages of groups of volunteers working possibly within the framework of a permanent professional structure. Since this type of humanitarian action is likely to become more frequent in the coming years, it would be useful to determine a psychological, sociological and technical profile of the most adequate voluntary personnel. Use of volunteers allows considerable flexibility and adjustability of action. It can nevertheless engender situations of conflict, particularly as regards communications and especially conflicts of authority. Some volunteers would benefit by developing a sense of commitment and an unconditional acceptance of the necessity to have some hierarchy in a relief program at a time of emergency. Those responsible for a program formed of volunteers must exercise a degree of adjustment in the methods used for directing. Participation and dialogue with the higher-skilled volunteers are indispensable. Although volunteers cannot be considered professional in relief, they do not necessarily have to be considered amateurs.

The excellent results obtained by the League

of Red Cross Societies in using volunteers and the great flexibility of action resulting from this confirms without any doubt the value of the method. However, the increasing technical complexity of interventions, particularly in the field of nutrition, demands more rigorous selection based on personal qualities as well as on competence and professional qualifications. Scientific research workers can make a significant contribution to studying and reducing the partly inherent drawbacks of voluntary work.

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INTERAGENCY RELATIONSHIPS AND CONFLICT IN DISASTER: THE WILKES-BARRE EXPERIENCE*

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Every year, on the average, the United States experiences at least a dozen disasters of major proportion, in addition to as many as 40 catastrophes of lesser magnitude. In some of these situations the population may have advanced warning such as the mounting threat of flood waters, or weather reports of situations conducive to the spawning of tornadoes. In other instances there is little if any warning, such as the bursting of a dam or an airliner crash into a populated area. Generally speaking, the magnitude of any of these disasters is determined primarily by two separate factors – the number of individuals killed, injured or displaced, and the estimated dollar value of damages to property and possessions.

While these two gross indicators do serve as adequate barometers for specified purposes, in most instances the majority of the disaster-affected population will survive without serious physical injury. That is not to say that they survive without experiencing a variety of physical, social, and psychological needs.

During the immediate post-disaster phase, victims are usually provided with the necessary physical comforts to maintain adequate equilibrium. Temporary housing, food, clothing, and medical care are usually available almost immediately after the disaster, and in many instances during the actual period of impact itself.

Once the immediate danger has passed, and the need for crisis-oriented medical and physical services is lessened, there is a remaining – in fact, substantially increased – need for both hard and soft human services. Recent disaster experiences (Penick et al., 1976; Kafrissen et al., 1975; Zarle et al., 1974) support the notion that disaster victims typically experience a variety of potentially detrimental social and emotional effects, although incapacitating emotional reactions are rare. Experience has also shown that active, aggressive intervention on the part of mental health and social service providers can help eliminate potentially serious consequences.

Traditionally, the delivery system for these services has been and continues to be the public and private social service agencies in each community. While these caregivers might function in a highly proficient manner under normal circumstances, the impact of the disaster tends to drastically alter the status quo, bringing about a new situation in which traditional patterns of behavior and service

*This is a revised version of a paper originally presented at the Annual Meeting of the National Council of Community Mental Health Centers in Washington, D.C., February, 1975.

delivery may be neither possible, appropriate, nor particularly helpful.

THE AGNES DISASTER

In June 1972 the torrential rains associated with tropical storm Agnes, then centered over central Pennsylvania, triggered off what has since been referred to as the greatest natural disaster in American history. The normal spring thaw, coupled with an unusually heavy rainfall along the Susquehanna river basin into southern New York State during the previous two months, together with the excessive rains of Agnes, set into motion a disastrous chain of events.

At Wilkes-Barre, situated along the banks of the Susquehanna, normal river level for that time of the year was about five feet. On 22 June 1972 the river crested at 40.6 feet, forcing in excess of 80,000 people to evacuate their homes. The flood waters, ultimately extending as far as six miles across in some areas, damaged approximately 25,000 homes, about 400 beyond repair. Fortunately, loss of life was held to a minimum, with six deaths recorded in the Wyoming Valley. Physical damages, however, were almost incalculable. While financial estimates vary, it is generally conceded that the total exceeded two billion dollars.

As the flood waters gradually retreated, disaster victims were presented with an almost unbelievable picture. Two-story houses, many totally submerged for several days, were grotesquely misshapen. Others, carried from their foundations, smashed together or wedged under railroad underpasses. Washing machines were found entangled in overhead wires, automobiles piled one upon another, and over 1000 caskets unearthed from a flood-gouged cemetary provided mute evidence of the fury of the flood waters.

The type, nature, and degree of intensity of the problems which present themselves following a disaster will vary widely depending upon a number of factors: the nature of the disaster, its magnitude, the time of impact, the extent of warning, the community's experience with prior disasters, the segments of the population affected, and the character of the community in terms of socioeconomic level, culture, and primary religious conviction. These, and a number of other interrelated, somewhat idiosyncratic factors, can serve to trigger a series of highly complex post-disaster problems, to which the existing community resources are expected to respond in a helpful fashion.

The Wilkes-Barre experience presented ample opportunity to observe the interagency interactions, cooperation, and conflicts which tend to arise in disaster recovery efforts. From August 1972 to April 1975, the author served as Director of Project Outreach, to date the largest federally-sponsored mental health disaster intervention program organized in the United States. The experience of working directly in the flood-devasted regions of Luzerne and Wyoming counties, Pennsylvania, following the 1972 Agnes disaster, forms the basis for many of the observations and conclusions reported in this paper. While the following general areas discussed were developed primarily out of the Agnes disaster, the pattern of interagency relationships observed in Wilkes-Barre does not appear to differ markedly from experiences which have been reported after other, less intense, disasters.

It should be noted that interagency relationships are difficult to judge at the best of times, let alone the period immediately following impact. During the immediate aftermath of a disaster, individuals and organizations tend to engage in what can be termed altruistic behavior. People and organizations who have shared the experience of threat tend to join together spontaneously for brief periods in selfless, generous ways. Conflicts are put aside. Beyond this mutual supportiveness, there is what is referred to as the phenomenon of the expanded citizen role (Dynes, 1974), that is,

the desire of individuals to become involved in helping in some way. Unfortunately, this behavior is usually time-limited, seldom lasting beyond several weeks, at which time the solidarity begins to dissipate and conflicts arise.

PRE-DISASTER PLANNING

Traditionally, each community provides access for its members to a varying range of human services: hard services such as food stamps, cash assistance, and transportation, and soft services such as family counseling and mental health services. However, most of the communities in the United States give little evidence of any well-defined disaster plans. Although there are some communities which do have such a plan, these are by far in the minority. Furthermore, in those instances where there may be some type of plan, there is rarely a role for human service or mental health caregivers in the total recovery effort.

It is safe to say that the major emphasis of most of the current disaster plans is based upon a civil defense model; that is, the plan gives primary and almost exclusive attention to evacuation, emergency medical attention and provision of physical shelter for victims. There is no doubt that this type of planning is of primary importance, but concern is seldom evidenced in these plans for other community providers of human services.

This absence of clearly defined areas of responsibility for those entrusted under normal circumstances with a great deal of responsibility for the welfare of the population leads to confusion and wasted effort, and fosters inefficiency in service delivery at a time when human services are needed most. Under these circumstances it remains for individual agency personnel to decide how the disaster-affected population's needs are best met, and to develop a plan to meet the individual agency responsibility in the most effective manner. The unfortunate aspect of this approach to planning in a vacuum is that it can lead to duplication, with a resultant imbalance and inefficiency in service delivery.

Even in the event that the community does have an appropriate disaster plan, including human services, there is the possibility that the magnitude of the disaster might render the plan useless. In Wilkes-Barre, which had no such integrated plan, one of the first areas inundated was the civil defense headquarters, housed in the lower level of the county court house, on the river bank. Further, since virtually all of the human service delivery organizations were headquartered in downtown Wilkes-Barre, these facilities were also inundated almost immediately. In addition, the magnitude of the disaster was such that a large number of the normal community caregivers found themselves victims of the flood and therefore incapable of carrying out their pre-disaster role, at least temporarily.

In situations such as this, no pre-disaster plan really could have been totally effective because the individuals necessary to implement that plan were simply not available, being counted among the victims. This probably represents an atypical situation but it does point out that while comprehensive pre-disaster planning can be very helpful and should be encouraged, one runs the risk that those included in the disaster recovery plan will find themselves either direct or indirect victims.

Shortly after the Agnes disaster, it became apparent to those involved in the recovery efforts there was a pressing need for coordination and cooperation among the agencies and bureaucracies involved in directing various aspects of the recovery effort. It also became apparent that implementation of any kind of a coordinated effort would be a mammoth undertaking, given the wide variety of separate groups involved in the recovery effort, each with different goals, objectives, mandates, and funding sources.

In the Wilkes-Barre region, the federal

response was handled primarily by the Office of Emergency Preparedness, the Army Corps of Engineers, the Department of Housing and Urban Development, the General Services Administration, and the Department of Health, Education, and Welfare, in addition to at least seven other federal agencies which were active to some degree. This intensive federal response was combined with the activities of some fifty local and state service providers. Obviously, coordination among this variety of agencies and organizations was a gargantuan task, probably without precedent in American history. As to be expected, there was a great deal of misinformation and duplication. Simply, many agencies were totally unaware of what others were doing.

To illustrate this point, one of the areas of conflict observed in the Wilkes-Barre area related to the temporary group mobile home sites set up throughout the county by the Department of Housing and Urban Development (HUD). Thousands of families eventually resided in mobile homes, in parks ranging from as few as twenty trailers to one projected to handle 999 units. These individuals automatically became the target of the social service delivery system. In some cases, a family having suffered the trauma associated with the complete loss of property and possessions, having resided in a temporary evacuation center for some period of weeks or months, now facing the adjustment to living in a mobile home in an unfamiliar environment, with an uncertain future, might have as many as five or six separate social service personnel knocking on the door in one day. Many of these individuals asked the same kinds of questions, while others were involved in completing necessary surveys and data collection. However, there was little coordination or cooperation in these activities between the individuals and groups involved. It became such a problem that HUD, with the cooperation of state authorities, set up a special regulation that no personnel were to be allowed in the group mobile home sites without having first been approved by the HUD resident advisor assigned to each camp. Violations were to be reported to local law enforcement officials. While this directive obviously saved the victims from what some might consider harassment, others felt that the cure was worse than the disease, since it had the potential to seriously limit the delivery of needed social services to a large segment of the flood-affected population.

NATURE OF HUMAN SERVICE ORGANIZATIONS

Perhaps there is an implicit assumption underlying the fact that social service agencies are often excluded from participation in community disaster plans. This exclusion might relate to the fact that in most instances they do not have sufficient resources to cope with extraordinary situations. The nature of social welfare organizations is such that their resources are usually limited to specifically defined goals, with little if any reserve, or access to additional sources of funding. For the most part, community-based agencies do not possess emergency resources or means to get them, keeping in mind there will usually be a substantially heightened demand for services following a disaster.

In the Wilkes-Barre area, expanded social service delivery was made possible through a number of means including: (1) temporary volunteer staff from mental health and family service agencies outside the Wyoming Valley, (2) special monies appropriated by the Commonwealth of Pennsylvania, (3) direct contracts from the National Institute of Mental Health, (4) special church contributions and church related volunteer staff, (5) Red Cross and Salvation Army, and (6) temporary reassignments of federal and state personnel. In general, the increased resources were provided from outside sources, as they were not available locally. This type of situation however may vary widely depending upon

the community affected and the extent of the disaster. For example, in sections of upper New York State, also affected by Agnes flooding, community-based philanthropic or industrial concerns provided substantial financial and other resources to aid in the recovery process.

For the most part, public social service agencies are confined to operating within a series of general goals, if not specific mandates. While these may be bent, the agencies may still be bound by regulations not always compatible with the existing situation. Private sector agencies usually have much greater flexibility, but possess substantially fewer resources.

Beyond this, some groups such as the Red Cross, Salvation Army, and certain church-related groups have community sanction to function during disaster, while existing community resources generally do not possess this approval. Organizations such as these are accepted, and perhaps expected to play a large role in disaster recovery. Mental health workers, on the other hand, when identified as such to disaster victims, are often spurned by individuals who do not perceive themselves as in need of these services. This was the Wilkes-Barre experience, where individuals obviously in need of such services firmly refused to deal with mental health personnel. The same services, however, were accepted if provided by "human service counselors".

INTERAGENCY COOPERATION

It appears that social service organizations relate to each other during the disaster recovery phase in a manner similar to pre-disaster days. This is not to suggest that there are not some obvious differences and necessary adjustments caused by the immediate impact of the disaster.

As a general rule, organizations will seek to relate in ways that they found successful previously. It will probably be an atypical situation in which patterns of planning, co-operation and coordination existing among social service providers prior to the impact are drastically altered during the immediate post-disaster phase. On a long term basis, however, the disaster experience may produce either positive, unifying effects, or the opposite.

In communities where there was inter-agency trust and cooperation prior to the disaster, there appears to be an increased degree of positive interaction triggered during the recovery phases. If there was agency conflict, mistrust, or dispute over functions, these tend also to be exaggerated after the disaster.

As an example, in Wilkes-Barre, local, state, and federal mental health personnel cooperated to develop a model outreach program proposal to deal with the anticipated emotional crises triggered by the disaster. In a period of six weeks the proposal was developed, funded, and some twenty (of a total group of fifty) specially trained indigenous paraprofessional human service counselors were in the community. The National Institute of Mental Health (NIMH) funded Project Outreach, as the program was called, in the amount of nearly $ 500,000 for one year, in addition to funding an on-going training program and an evaluation component.

When the grant was announced by the local mental health/mental retardation administrator to the social service agency personnel at a regular daily disaster recovery meeting, there was a highly mixed reaction. Some agency representatives voiced fears that the new program would assume their rightful (traditional) role in the community, and others expressed the feeling that the proposed fifty new workers would create a substantially increased caseload which the existing resources could not adequately handle.

In this case, the local social service personnel themselves could not agree on the Outreach proposal. Some, primarily mental health service providers, were supportive;

others recommended that the NIMH funding be rejected. Still others wanted to accept the funds, but then divide it up among the existing agencies for additional staff positions. Support for the Outreach program from the private sector was limited, while individuals from the public sector were either supportive or indifferent. Perhaps realistically, the latter group saw the least threat to their own situations by introduction of a new program, albeit a temporary one. Agency personnel were apprehensive about the introduction of the new program since they had no precedent upon which to base their estimate of the degree of interface with their program and its future effect on the existing service delivery system.

In the spring of 1973, after Project Outreach had been in operation for approximately nine months, the evaluation team carried out an independent interagency inquiry. While the primary purpose of the study was to measure the degree to which Outreach had achieved its own service objectives, some of the data does lend itself to interpretation in terms of the issues raised above.

The interagency inquiry involved interviews with representatives of 44 separate agencies throughout the two-county flood area and included, among others, primary medical care providers, state and local police agencies, social service and welfare providers, disaster relief agencies, and mental health/mental retardation providers.

The results of the study indicated that two-thirds of the agencies surveyed had learned of the existence and function of Project Outreach within six weeks of its inception, with nearly 90 percent reporting an awareness of Outreach services within four months. Despite a concerted effort on the part of the Outreach staff to initiate contact with all service providers immediately after the beginning of the project in August 1972, it was disillusioning to note that 10 percent of the agencies contacted reported not learning of Outreach services until early 1973.

While the majority of the agencies reported an awareness of Outreach very early, the fact that some did not increased the potential for conflict, misunderstanding, and the possibility that some clients would be overlooked, thereby not receiving services.

When asked how they learned of the Project Outreach program, half reported learning through direct contact with an Outreach worker, 29 percent indicated learning through other agencies, 21 percent through the media, and 3 percent through county MH/MR providers. However, in response to an inquiry concerning the degree to which they were informed, and whether they had been sufficiently informed to know how and when to utilize Outreach services, 14 percent characterized themselves as poorly informed with an additional 11 percent reporting they contacted Outreach for clarification. While the majority (75 percent) felt they were adequately informed, this data also has interesting implications.

First, those who reported first learning of Project Outreach through the mass media (radio, television, and newspapers) represented only a small percentage of the population. This, despite the fact there was a great deal of media coverage, including news conferences on several different occasions, at which time top level federal, state and local personnel participated. In most disaster situations the mass media is the most effective means of getting necessary information to the population. For example, in assessing the degree of agency awareness on the part of victims of the San Fernando earthquake in 1971, Bourque et al. (1976) conclude that in addition to personal contact, media coverage is a highly important source of information. However, from the present data it appears that a distinction must be made between the general population and its service providers in measuring the value of the mass media.

Based on this data, specific interagency communication is most important in clearly

outlining the available services, especially in light of the fact that nearly 30 percent of the agencies reported receiving their information from other service providers, rather than from the primary program or the news media.

The evaluation study also requested that each of the agencies report what they felt were particular strengths or weaknesses of the Outreach program. These are important since they tend not only to identify positive and negative aspects of the project as perceived by other providers, but also some of the potential sources of interagency conflict. The results of the study are summarized in Table I.

Of the forty-four agencies included in the survey, twenty did not feel qualified to judge, nineteen made both positive and negative comments, and the remainder was either totally positive or negative. Most respondents indicated more than one strength and/or weakness.

The results of the survey are inconclusive, in that it represents a measure of agency perceptions of another agency, and thus the strengths and weaknesses can be colored by a number of unknown factors. Nevertheless, the data is interesting in that, for example, the youth and advocacy role of the staff was listed as both a positive and a negative quality, as was the fact that Outreach provided specific services, not only referral. Certainly many of these reflect disputes over functional duplication as well as conflicting agency goals, outlooks, services and philosophies.

AGENCY POLICY

Another of the major problems inherent in disaster recovery relates to the fact that some agency goals, and the subsequently formulated policy and procedures implemented to achieve these, are sometimes in direct contrast to goals of another agency.

In the Wyoming Valley, the Department of Housing and Urban Development was entrusted with the responsibility of providing appropriate temporary housing for disaster victims in need. This in itself was a gigantic task which was done reasonably well under extremely difficult circumstances. However, HUD policy was to assign individuals to group mobile home sites on a first-come-first-served basis. There were exceptions in special instances, but for the vast majority this was the policy. No effort

TABLE I

Summarized Results of Interagency Inquiry

Reported strengths	Percentage of total positive comments N = 30	Reported weaknesses	Percentage of total negative comments N = 27
Availability, immediacy of response, capability of Outreach	37	Inadequate number of referrals made	15
Program flexibility, willingness to become involved, act as advocates	7	Independent operation, inadequate cooperation with other agencies	19
Young, energetic competent personnel	10	Duplication and overlap of existing agencies	15
Effective augmentation of mental health services	13	Program inadequately publicized	18
Miscellaneous (follow-up, reliability, persistence, provide services not only referrals, preventative approach)	33	Miscellaneous (staff too young, over-eager, immature, overzealous, too flexible)	33

was made to assign victims to parks near their home and community, or with social groups from their neighborhood who might provide mutual support during this traumatic period.

When efforts were made to modify this procedure, conflict arose. While virtually everyone was aware that the disaster victims would be residing in the temporary housing for some time, the HUD mandate was to operate a temporary housing program with the goal of returning disaster victims to the community as soon as possible. While this policy was designed to meet the goals and objectives of one organization, it was in direct conflict with those of some other human service agencies. Harshbarger (1973) noted the same problem following the Buffalo Creek disaster, and argued that the disaster intervention system could have the effect of maximizing pathology.

The major approach to the community utilized in the Outreach program stressed neighborhood canvassing in an effort to reveal individuals in need of help, whether this be transportation, help with filling out forms, or just allowing the individual opportunity to ventilate his feelings. Under terms of the previously mentioned HUD policy, Project Outreach workers were not allowed to engage in the canvassing effort with those families residing in the group mobile home sites, and could only work with those individuals when a direct referral was made by or through a HUD park manager or resident advisor. In practice, the Outreach workers were usually able to establish positive working relationships with the individual HUD staff member at each park. Nevertheless, while the policy was well intended, many felt it demonstrated an insensitivity to the mental health needs of the residents. This is a clear example of the goals of two disaster intervention agencies being in direct conflict. It was some nine months before Outreach staff were allowed free access to the parks, and then only under the auspices of the Commonwealth of Pennsylvania.

LACK OF APPROPRIATE INFORMATION

A prime source of interagency conflict and frustration is the red tape and the bureaucratic nature of some agencies. This situation is certainly due in part to misunderstanding of the ability of various agencies to respond as quickly as one might think appropriate.

Following Agnes, social service personnel typically encountered individuals with a myriad of concrete problems which quite often were beyond the control of either the victim or the helper. This proved to be a mutually frustrating issue. Victims had to apply for a variety of disaster-related programs, including Small Business Administration (SBA) loans and grants, state grants, unemployment compensation, food stamps, public assistance, HUD temporary housing, and Red Cross vouchers. Many victims expressed frustration at what seemed to be constant changes in policy, feeling they were getting a runaround.

As an example, shortly after the flood waters receded the victims received notification that they should throw out all unusable possessions which would be removed by the Army Corps of Engineers. Many did so, only to be later informed that there would be difficulty with grant or loan applications since they had no photographs to verify their losses. Angry victims triggered interagency squabbles. Many felt that chaos was also bred by a high turnover of disaster agency employees, which meant that flood victims were sometimes forced to detail their plights to new faces on each visit. At the SBA office in Wilkes-Barre, which granted more than $ 550 million in low-interest disaster loans, it is reported that twelve persons occupied the job of chief administrator during the first year after Agnes. Many victims and agency staff felt that each of these individuals tended to interpret the regulations somewhat differently. As a result some victims were throught to have benefited while others suffered.

REACTION TO OUTSIDERS

Interagency conflict during disaster can also be triggered by the influx of "outsiders" to the disaster scene. It is an observable phenomenon that disaster-affected communities expect immediate, clearly defined direction and assistance, but paradoxically tend to resist what is perceived as outside interference.

The same phenomenon can be observed in interagency relationships. Local caregivers tend to resent outsiders, unfamiliar with the character and needs of the community, who try to influence the local agency scene. A major problem in these circumstances is that there is usually no real power or authority to pull together the various community resources in a coordinated effort. One might typically expect that local private and public agencies, state-related agencies, federal agencies, religious groups, the Red Cross, and others with a myriad of separate mandates, goals, funding streams, lines of accountability and sensitivity to human problems would find it difficult to cooperate.

CONCLUSION

The purpose of this paper has been to point out areas of actual and potential interagency difficulties associated with natural disaster, utilizing the experiences of the 1972 Wilkes-Barre Agnes flood. In general what has been presented is an overview and is not generalizable to all situations. While no pre-disaster plan will eliminate all potential sources of conflict, certainly it will go far to help insure against many unnecessary and unanticipated problems. It seems, however, that all too often in the United States we tend to try to "reinvent the wheel" following each disaster. The emotional, social, financial, interagency, and reconstruction problems, among others, are reported over and over again following each disaster. We are only now beginning to profit from our experiences.

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POST-DISASTER RUMOR CHAINS: A CASE STUDY

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In the small Atlantic-coast Canadian city of Sydney, Nova Scotia, during a devastating windstorm [1], debris from a rooftop flew across the street and shattered the front window of the home of Mr. and Mrs. Ronald Mill.* The flying glass from the window struck the Mill's two-year-old daughter, Debbie, leaving her dazed and bleeding from the head though not badly hurt (she required two stitches in her forehead). But, within a matter of hours, rumors had spread in Sydney, both among those who knew her or her parents and among those who did not, that Debbie Mill was dead.

In the summer 1974 issue of the *Journal of Communication*, Ralph Rosnow summed up the current state of knowledge about rumors, then issued a challenge [2]. He said there are significant questions yet unanswered about rumors, among them questions about the personality co-ordinates of rumor-mongering and the attitudes and orientations of people who spread rumors. This brief study – of the spread of one rumor, the rumor about Debbie Mill's death – is a partial reply to Professor Rosnow's challenge. It is a first report of the anatomy of a particular rumor. It provides initial information about the social and economic characteristics of those who spread it.

*The actual name has been altered for this article (Ed.).

The six-member research team that collected this data was not in Sydney by chance. The team was flown into the community 24 hours after the storm struck the community specifically to examine the patterns of communication [3]. The Sydney study is part of a continuing one financed by two Canadian government agencies: the Defence Research Board and Emergency Planning Canada. Three members of the team had been involved less than a year earlier in the successful tracing of news as far as ten stages across another community in crisis [4]. But the tracing of the Debbie Mill rumor – though rumor tracing is one of the team's long-term objectives [5] – was at least partly accidental and for that reason the data is not as clear as it might be otherwise.

The team is trying to examine the effectiveness of communications systems in crisis [6]. It is doing this by using a sample to acquire data about individual information sources, then tracing the flow of information from persons in the sample person-to-person to the original source. The technique involved is simply that of detective work: if a contact cannot be identified by name then the team members begin an exhaustive search for the contact. Usually this search is successful: in an earlier study 73 different interpersonal communication chains were traced to their

point of origin [7]. Over 100 chains were traced in a more recent study.

In some ways, the situation in Sydney was ideal for a crisis communications study. The power system had gone off, leaving the community with one surviving radio station. The police radio system had been damaged and knocked off the air. The phone system was partly knocked out, giving reduced service. An entirely new communications system involving citizens' band radio and some hand-held police radios had to be created to serve the city's needs.

In other ways, the situation was disapponting from a research point of view. There had been no warning of the storm from any source. There was no one focus of interest. The team found it hard to analyze interpersonal communications patterns because they were so diffuse. The only thing that did emerge in a small test sample was some evidence that the rumor about Debbie Mill had spread to some persons in the community but not to others. (Even this finding is a bit suspect: the question asked was, "thinking back, did anything you heard about the storm turn out to be wrong?" Some persons may have *believed* the story of Debbie's death and, therefore, answered "no".)

Because of its interest in rumors, the team decided to attempt to track down the source of the Mill rumor – a rumor which had appeared four times in a small sample of 60 persons. Three of those tracing attempts proved abortive although they were interesting:

- a person in the sample worked in the fire department. He said he had heard the rumor at work. Others where he worked said they had heard it too but no-one could recall who mentioned it first.
- a person in the sample had heard it from her son. He had got it from a hitch-hiker. He recalled that the hitch-hiker had come from "two blocks over the pass", a specific location. A door-to-door canvas in that area failed to reveal the hitch-hiker.
- a person in the sample had heard it from a neighbor's child. The child had heard it from a friend of his father. The father was a fireman as was the friend. This trail led to the fire station. (This was a different fire station than the one mentioned above.) Once again everyone there had heard the rumor. Once again no-one could recall where it came from first.

The fourth trace proved to be more productive. It led – as the step-by-step information below shows – to what appears to be the source of the rumor:

1. The person in the sample had heard the story from a friend, a girl who lived just a block or so away from her.
2. That friend had heard from another friend, a person who lived still another block away.
3. That friend had heard – this time by telephone – from a lady she knew. The lady lived just a few doors from Debbie Mill, (although she had phoned from the hotel to which she had been evacuated).
   In all three cases, the women had heard the child's name and that she was dead. They also heard that the child had been cut in the stomach by flying glass.
4. The woman who made the telephone call, however, had not originally heard the Mill child mentioned. While at supper at the hotel, she had overheard people at the next table talking about a child being killed by flying glass. She, herself, had been at the hospital when the Mill child arrived. Further, she had been talking to her husband who had seen the child hit and had seen her carried by her father to the waiting police car. When the lady and her husband heard a child had died they immediately assumed it was Debbie Mill.
   (From then on, the couple and all the evacuees at the hotel with them assumed the Mill child was dead. When Mr. and Mrs. Mill arrived at the hotel the next day, they were greeted with condolences for the death of their daughter.)

5. The people talking at the next table included a married couple. The woman was telling some friends she had heard that a child had been killed. She knew the street – MacDonald Crescent (the street where the child and the couple mentioned above lived) – but she did not know the child's name. She had heard the story from her husband when he arrived at a parish hall where she had been evacuated.
6. The woman's husband had heard the news from a neighbor as he and the neighbor chatted with police as they helped evacuate MacDonald Crescent (the street worst hit by the storm). The man had heard only that some child was killed but he said the story immediately took top priority in his mind. "I thought it was pretty terrible," he said. He told his wife as soon as he got to the parish centre.
7. The neighbor had not actually told him that a child had been killed but that he had heard that a child had been killed. He was not passing it on as confirmed news but as gossip. (Later he heard the story which included Debbie Mill's name: he passed that on, too.) The neighbor's source was another neighbor, a man who also helped evacuate the stricken area.
8. This final confirmed source was a man who had been driving people to safety during the storm. At one point as he made a detour he was told by a man – a person he could not identify – that a child had been hit by debris and killed. Another person later told him the child was not dead. He reported what he had heard anyway. (When he was interviewed one week later, he could recall mentioning the incident to half a dozen others, and he still believed it – he asked the interviewers if the story was true.)

The description of this rumor probably would stop there but for one coincidence: the place where the man (no.8) had stopped his truck and first heard the rumor was almost exactly "two blocks over the pass" – the area where the hitch-hiker had picked up the same story. It was also one block from the place where the police car had been when it got the radio call to take the child to hospital. At the time of the radio message, one of the policemen had been in a house making a phone call. His partner had been outside, his radio on loud, his car door open. There were bystanders all round. Some of the bystanders heard the emergency call, heard the reports of flying glass, watched the policeman run in for his partner and speed off, and put together the story of the child's probable death. One of them told half a dozen others – and, presumably, one of these others told the man who told the truck driver (no.8 above).

These facts were not as easily discovered as it might appear. The presence of the police car was discovered only because of the area-wide study of storm problems. The fact that the car took the call and that its radio was on loud and its doors open was first deduced, then confirmed in separate interviews with the two police officers, the dispatcher, and (eventually) with some bystanders. The bystanders were located only after extensive door-to-door canvassing.

In short, the rumor about the death of Debbie Mill had an official origin: a call by her mother to the police and a subsequent police radio call (this was before the radio system failed) for a police car to take her to hospital.

(For a while the team thought it had even stronger confirmation that this was the source: one of the two policemen had talked to the fireman who had been the source for the boy mentioned earlier. But the policeman said he had not talked about the incident to the fireman; in fact, the fireman had already heard and had asked him about it when they first met and he had not provided any information.)

The exact connection between the police car, the bystanders and the truck driver has not been located. Even without it, however, it

would appear to be enough data to examine some of the earlier hypotheses about rumors, specifically the hypotheses by Allport and Postman that rumors are levelled, sharpened and assimilated as they move along [8]. There is apparently support for all three ideas:

1. There is clearly evidence of assimilation – of the adding of more detail. This was done by the woman who overheard others talking at the hotel.
2. There was evidence of sharpening – of the focus on the alleged fact the child was hit in the stomach by flying glass.
3. There is some evidence of levelling – of the elimination of some details. The passing of the story from no.8 to 7 to 6 to 5 clearly involves some elimination of detail. The story becomes simply one that a child is dead.

But the material available here goes beyond data about what was said: there is also data on who said it – the research team gathered socio-economic data on each person in the chain described above. This data shows that, on the whole, the information was passed between persons who knew each other and who were mainly of the same socio-economic status. The pattern of communications rarely even broke more than one of the barriers of age or sex or religion or education or occupation or marital status. The chain is outlined again with data about the "who" instead of the "what" [9]:

8: Male, Roman Catholic, 41–50, married, English-speaking, elementary education, truck-driver;
7: Male, Protestant, 31–40, married, English-speaking, elementary education, truck driver;
6: Male, Protestant, 31–40, married, English-speaking, some high school education, wholesaler;
5: Female (wife of no.6), Protestant, 31–40, married, English-speaking, some high school education, housewife;
4: Female, Roman Catholic, 31–40, married, English-speaking, high school education, teacher;
3: Female, Roman Catholic, 21–30, single, English-speaking, high school education, clerk;
2: Female, Roman Catholic, 19, single, English-speaking, high school education, clerk;
1: Female, Roman Catholic, 21–30, single, English-speaking, some high school education, unemployed.

The evidence seems clear that only in the case of no.5 to no.4 (where the overhearing was involved) was any significant amount of break in socio-economic patterns involved.

The research team, incidentally, is trying to establish a means of measuring compatibility between persons in chains. Such a measure is necessary for detailed analysis of the more complicated news chains. One method is to score each variant – different age bracket, different religion, different sex, different marital status, different educational level – as a value of one. Given random distribution of such relationships, the chance of all characteristics being the same is almost one in 500; the probability of only one or two being different is also low. In this case, however, the average deviation is about 2.1 and five of the relationships have two or less differences between those who talked to each other. The person-to-person transmission of this rumor was carried by persons very like each other and far more alike than randomness would allow.

There is one other question that might be asked: what makes a person tell others about a rumor? Is it because the matter is important to him or her? The Sydney data provides little help in answering this question. Each of the persons in the chain was asked how they appraised the storm information (extremely important, pretty important, some importance, no importance) and how many persons they told who had not already heard. The answers cover the entire range:

8: Extremely important, told 8 others;
7: Some importance, told 6 others;

6: Extremely important, told at least 9 others;
5: Some importance, told no one (she was, in fact, overheard talking about it);
4: Extremely important, told 1 other;
3: Some importance, told 9 others;
2: Some importance, told 6 others;
1: No importance, told no one.

It might appear that people are, if anything, more inclined to spread rumors they do not consider important to them.

It would be presumptious to draw major conclusions from the study of one rumor. However, the actual tracing of a rumor is so rare an occurrence it does seem useful to state a number of hypotheses, some of which suggest findings of previous researchers:

1. Rumors are normally passed between those of the same socio-economic status [10];
2. Rumor-passers are not concerned about the importance of the information to them [11];
3. Rumors are – as Allport and Postman postulated – levelled, sharpened and assimilated [12];
4. Rumors do sometimes have a specific source: they are not merely created to fill a vacuum;
5. Rumors rarely break sex lines except where persons in the same families are involved;
6. Rumors are normally not carried across language barriers.

Finally, it should be noted – as some research suggests [13] – that the story passing through the rumor-chain was essentially accurate: while Debbie Mill was not dead, it was she who was injured, and she had been struck by flying glass.

NOTES

1 The storm and its effects are described in two places: Jim Jefferson and T. Joseph Scanlon, *The Sydney/Big Storm Study*, (Ottawa, 1974); T. Joseph Scanlon, "Sydney - Something to Blow About", *Emergency Planning Digest*, December, 1970, pp. 10–13.

2 Rosnow, Ralph C., "On Rumor", *Journal of Communication*, 24, 1974, pp. 26–38.

3 There are a number of background studies concerning disaster research. The model is drawn from Alfred D. Biderman, "Anticipatory Studies and Stand-By Research", in Raymond A. Bauer, ed., *Social Indicators* (Cambridge, 1966). Thee team format at Carleton is described in T. Joseph Scanlon, *An E.C.R.U. Manual*, (Ottawa, 1975), 73 pp.

4 T. Joseph Scanlon, *The North Bay/Slater Study*, (Ottawa, 1974).

5 There are a great many studies of rumor:
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6 The team's design is described in T. Joseph Scanlon, Brian Taylor and Jack Graham, "The Development of a Standby Research Capacity at Carleton University". Paper presented to the World Congress of Sociology, Toronto, 1974.

7 *The North Bay/Slater Study*, op. cit.

8 Allport, F.W. and L.J. Postman, *The Psychology of Rumor*, (New York, 1940). Another study suggests reliability is higher if the message is more important to those passing it on. See T.M. Higham, "The Experimental Study of The Transmission of Rumor", *Interpersonal Communication: Survey and Studies*, New York, 1968, pp. 273–291.

9 Other persons have tried to look at similar rumors. See O.M. Larsen, "Rumors in a Disaster", *Journal of Communication*, 4, 1954, pp. 111–123.

10 *The North Bay/Slater Study*, op. cit.

11 Rosnow, op. cit., p. 35.

12 Allport and Postman, op. cit.

13 See T. Caplow and T.M. Higham, op. cit.

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EDITORIAL: DELIVERY OF EMERGENCY MEDICAL SERVICES IN DISASTERS

All of the articles in this issue focus on the delivery of emergency medical services (EMS) in large-scale mass casualty-producing situations such as are produced by natural or technological disasters. A major reason for devoting an entire issue to this subject matter is that nowhere does there exist a single collection of writings which are concerned exclusively and in a generic way with the problem of EMS delivery in disasters. Most of the existing published work on EMS disaster planning and response consists either of single descriptive case studies or of writings concerned with specific medical or administrative problems faced by hospitals and other EMS deliverers in attempting to respond to disasters.

Although all the articles in this issue have the same substantive focus, the authors apply a range of different perspectives to the analysis of the topic. The issue begins with a paper by Holloway, the former director of EMS for New York City. Holloway presents a very realistic and insightful picture of EMS operations and planning, based on his own actual involvements in coordinating real-life mass casualty events, a perspective which is important but limited, nevertheless, because it is derived from the author's experience with only one community, and a unique one at that. The issue ends with an article by Gibson, a major figure in EMS research, which expresses a viewpoint almost directly opposite that of Holloway's. The need for applying rigorous research methods and systematic theoretical analyses to the problem of EMS delivery in disasters is the message of this paper, a point which will undoubtedly be well taken by most EMS researchers. However, Gibson is more interested in the development of a scholarly and scientific theoretical base for the EMS field than he is in considering the kinds of practical questions EMS practitioners such as Holloway must address on an everyday basis.

The perspective represented in the articles written by staff members of the Ohio State University Disaster Research Center (DRC) falls somewhere in between these other two extremes – that is, between the practical questions of the experienced EMS deliverer and the theoretical issues of the EMS researcher. Each presents the results of comparative research on specific substantive problems or questions in the delivery of disaster EMS. Although these authors employ a social science perspective in analyzing EMS delivery in disasters, the articles are written more for EMS planning and operational personnel than for other social science researchers.

In order that the various topical papers be more meaningful, Dynes, the co-principle investigator of the Health Resources Administration sponsored research, offers a background introduction on the two-year comparative study which DRC has been conducting of the delivery of EMS in disaster and other large-scale mass casualty-producing situations. Tierney and Taylor's article follows, and is essentially a summary of many of the Center's substantive findings at the end of its first year of study. Perhaps one of the most important findings they present is that, contrary to the belief held by many EMS planners and operational personnel, EMS delivery in disasters is

not simply more of the same thing as EMS delivery in everyday situations. Rather, EMS delivery is qualitatively, as well as quantitatively, different from everyday EMS and, thus, requires different kinds of organizational responses and pre-planning.

The paper by Worth and Stroup analyzes in what ways that passage of federal EMS legislation has had an impact on the operation of EMS delivery in large-scale medical emergencies. They compare EMS care in nine mass casualty events which occurred prior to the establishment of federally funded EMS systems with EMS care in eleven mass casualty events which occurred after the establishment of the EMS systems. They presented some surprises, not the least of which is the finding that many of the problems EMS deliverers are presently experiencing are the same problems which existed prior to the establishment of the federal guidelines.

Golec and Gurney address perhaps one of the most important components of the delivery of EMS disaster situations – needs assessment. Using data from 18 disasters, they analyze the extent to which an initial on-site needs assessment did or did not occur, and they then go on to describe the typical consequences for hospitals when an adequate needs assessment was not undertaken. Finally, they examine the factors which account for why, in most disasters, an adequate on-site needs assessment does not take place.

The article by Neff takes a step forward in advancing our understanding of how sociopolitical factors – specifically community and jurisdictional boundaries – influence EMS delivery in disasters. She systematically documents the not too surprising finding that no matter how advanced the technology or how abundant the resources, an EMS system's effectiveness in responding to disasters is intimately linked to very basic social processes like conflict, cooperation and competition.

Wright's paper represents a style and model toward which disaster research is striving. His analysis arrives at a theoretical model depicting the principle factors which account for whether casualty handling organizations exhibit a centralized or independent response pattern in mass casualty events. He then goes on to assess the effect which centralized or independent response patterns have on effective service delivery.

Whatever the limitations of the different perspectives indicated by the articles in this issue – and each perspective is but only a partial view of the reality of EMS delivery in disasters – all of the authors in this issue demonstrate that much has been learned and that there is yet more to be learned about the handling of medical emergencies in large-scale crisis situations. The work of the researchers found in this issue is also representative of that of a whole new generation of scholars who are applying their basic social science skills to the analysis of the question of how groups and organizations respond to natural disasters and other collective stress situations.

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OPERATIONS AND PLANNING IN MULTIPLE CASUALTY INCIDENTS

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INTRODUCTION

Those who reflect even for a moment on the title of this article may wonder why operations would precede planning. One normally prefers to have a plan before taking action. This is certainly true with the kind of action necessary to cope with a multiple casualty incident (MCI). On the other hand, MCI operations are not easy to plan without experience, and therefore operational experience becomes probably the single most important planning factor in eventually developing an effective MCI response.

THE NEED FOR A MEDICALLY ORIENTED PLAN

Obviously, one has to have a basic plan. The objective of this plan should not change, and should be to provide currently achievable and necessary medical care promptly at the scene, and to remove patients expeditiously to a hospital(s) that has the resources and capability to care for the patients – this removal either to be direct or following secondary transfer.

Basic to this objective must be a realization that an MCI is or certainly should be an event requiring a *medically* dictated response. The best medical care under the circumstances is *the* primary requirement, and it is this that must be emphasized, rather than the quickest response, fastest transportation, or most sophisticated communications system. To a greater or lesser degree, these are requirements, but they are really adjuncts to medical care and should not be permitted to serve as substitutes. Because good medical care is the prime goal, planning for the basic objective should include major input from physicians and nurses experienced in emergency care treatment. Dependent on the resources available, the medical professionals must determine the level of care that can reasonably be achieved. In a region with advanced life support response units, sophisticated on-scene care is possible, where it may not be if only basic life support teams are available. These are the factors that must first be considered prior to planning scene control, transportation logistics, etc. Hospital delivery also must be based on patient medical need, and not on the desire of a hospital to receive patients or an ambulance to bring them. Thus, professional medical input to determine policy and objectives is the first requirement in MCI planning.

The actual formulation of the logistical and operational plan probably should not be the responsibility of physicians or nurses, but rather those who are the providers – essentially the public safety people who must develop

the coordination of resources and all that that entails.

BARRIERS TO A WORKABLE PLAN

The MCI plan that has been medically formulated and carefully constructed to maximize coordination still will undoubtedly be defective when put to an actual test. Few of us expect most plans to work perfectly, but in MCI planning, the barriers to perfect operation are practically insurmountable. To begin with, MCIs take place in different settings. Coping with the effects of a tornado that has produced destruction over a wide area is far different from the collapse of a single building where trapped victims are slowly evacuated over a period of hours. In the latter instance the incident is geographically limited with sufficient time for the medical response to get in place; but not so in the former, where victims may be readily accessible but scattered over several square miles. A different plan for every type of event would be totally confusing; therefore, the plan devised must be flexible in an attempt to counter different demands. The danger with flexibility is that it dilutes the plan, and leaves unsaid "what to do if...."

MCI response requires the sudden, effective coordination of multiple groups; a difficult task under everyday conditions, but far more difficult at a multiple casualty scene. A large fire requires the effective coordination of multiple fire units or even departments; in contrast, MCI response utilizes a heterogeneous array including police, firefighters, ambulance personnel, civil defense personnel frequently, as well as nurses, physicians, and hospital administrative personnel. To expect these diverse groups to work in perfect rhythm and harmony on an occasional basis is unrealistic. Frequently potential discord between groups can be discerned at the planning stage, but is glossed over with the feeling that when the "chips are down" everyone will work together. This attitude may result in a plan being promulgated more easily, but in fact dissatisfaction at the planning level may well blossom into overt non-cooperation at MCI scene level. This is a problem that if neglected can add an unnecessary barrier to those that already exist.

There is no single word to describe a multiple casualty scene. One instead reads of "terror", "confusion", "turmoil", "uncertainty", "anguish", "confusion", etc. It is not by accident that confusion is mentioned twice; it will appear again and again in any list of words describing the scene of an MCI. The MCI scene seems to have a major psychological impact on even those continually exposed to the everyday flow of acute illness and injury, whether public safety or medical personnel. We are trained to react to the individual, and to a certain extent, to prioritize when several individuals are presented at once. But where many individuals all appear to need our concurrent attention, we experience difficulty coping – we do not know where to begin. Because of this uncertainty, priorities continually change. At first one priority is to attend to a patient; suddenly it changes to become mass movement of victims to a safer location, interrupted by a new priority to survey all patients before taking further action, etc. Confusion is inevitable.

The psychological impact of working under difficult conditions in a strange environment becomes a factor. The emergency department nurse, for instance, who feels at home in the bustling confines of that department, may feel completely overwhelmed when confronted with an equal number of patients scattered around a transportation accident. About the only time the nurse is going to be exposed to such an environment is during an MCI – so not only is the exposure rare, but also it occurs under the worst of conditions.

A definition that we have used before is that disaster response is many people trying to do quickly what they normally do not do, in an environment with which they are not familiar. The most important barrier is frequency. If MCIs were frequent the "many people" in the above definition would be doing what they

normally, or at least frequently, do and would be used to the environment. While increased frequency of MCIs would be very helpful in terms of developing effective responses it is hardly acceptable to either desire or expect that such should happen.

The fact that a medically effective MCI response is difficult to achieve should not serve as an excuse to neglect planning. Certainly one needs an effective regional EMS system for an effective MCI response. If the daily handling of acute patients at either the pre-hospital or hospital level is marginal, the handling of mass casualties will be predictably poor. Before spending extensive efforts on disaster planning, a region should concentrate on developing its everyday system, and once this has reached at least an acceptable level, pursue in greater depth how the everyday system will be utilized for mass casualties, and what extra-ordinary measures have to be incorporated.

As emphasized earlier, the first step is to outline what medically needs to be achieved, and based on the resources available, what is practically achievable. One then attempts to combine flexibility with everyday and extra-ordinary response capability into a coordinated whole, taking into consideration local "politics" that requires deferral to a particular official who, rightly or wrongly, insists on "his" way. This is as much as one can or should expect to do in the initial planning stage.

It is far wiser to begin with a simple plan and build upon it as necessary than to devise, at great effort, a sophisticated plan of action that is more difficult to carry out than the actual MCI operation.

OPERATIONAL EXPERIENCE AS A PLANNING FACTOR

Operational experience is a far more important factor in success than "brainstorming" a detailed sophisticated plan. Of course, operational experience is gained only at the rate MCIs occur, and a single MCI does not provide a whole gamut of experience.

Our own experience in New York City in the past decade, however, has convinced us that our improved ability to provide medical care to MCI-produced patients was not a product of original planning, but rather was the product of confrontation with the factors that served as barriers to effective operation, and repeated opportunities to cope with these barriers and overcome them. Total success has still not been achieved.

THE NEW YORK CITY PLAN

The Citywide Disaster Medical Plan of the City of New York was written in 1968 in response to the great concern of the City's administration about civil disturbances. Not only was there no plan for coping with the medical care aspects of riots, there was really no specific plan for dealing with any kind of mass casualty situation beyond sending "some" doctors and nurses from the nearest major city hospital.

The Plan in its original edition was simple, flexible, and was based on medical objectives. That it was simple resulted not so much from a realization of the importance of simplicity as from a general lack of knowledge as to what more we could add. The Plan stressed the response of EMS (emergency medical services) personnel, hospital medical teams (similar to previous procedures), scene triage and treatment, and the delivery of patients based on categorization of hospitals into three levels of capability. Hospital representatives had strong input into the Plan as did the Mayor's Emergency Control Board. Review sessions were held with officials of both the Police and Fire Departments prior to Plan publication at the beginning of 1969. At this time an EMS organization existed but without a great deal of control – ambulances were as much the responsibility of hospitals as of EMS, the Police Department was totally responsible for

the dispatch of EMS ambulances (EMS, then known as the Ambulance and Transportation Service, was part of the Department of Hospitals), and EMS lacked 24 hour supervisory coverage.

The workings of the Plan called for response of ambulances dispatched by and at the discretion of the Police Department. If warranted, the Police Department would also dispatch a hospital based disaster unit staffed with nurses and resident physicians. The latter would be responsible for medical care and medical decisions at the scene, while the EMS official on the scene would serve as liaison to police or fire officials in charge, coordinate ambulance activity, provide logistical support to the professional staff, as well as provide administrative direction. There was general agreement to the soundness of the Plan. The only concern expressed was by the administrators of two of the municipal hospitals supplying disaster teams who felt that their administrative staff should assume responsibility at the scene rather than someone from EMS.

Over the next two years, there were perhaps a dozen incidents that could be considered full scale MCIs. In the great majority, patients received no significant evaluation or care at the scene, and were transported to hospitals based not on categorization but rather on proximity, or the transporting ambulances' base hospital.

On first evaluation, we had every right to question whether there was any reality to our Plan. Still, there were bright spots. We found that once we could control the medical response at the scene, and could make police or fire officials aware of our presence, that it was possible to control patient handling and distribution. This generally occurred when higher level staff of EMS reached the scene early on in the course of the incident.

THE EXPERIENCE PROCESS

While disappointed that the Plan was not being followed, we still felt that our objectives were correct, but that our methods had to be either improved or modified. Two incidents a week apart in 1970 firmly convinced us that having medical teams respond to the scene was of minor value unless they had an immediately available "workshop" for patient care. In each incident – one a skyscraper fire, the other an explosion – the responding medical teams, in spite of timely arrival, were of little value due to lack of, or delay in finding, suitable treatment space. A sidewalk in December (or for that matter June) does not constitute suitable space for definitive treatment.

Less than a year later we had our first MERVAN (Mobile Emergency Room Van) unit, a gift of the Julius E. Stolfi Educational and Research Fund. There are now 5 such units stationed within New York City, each equipped as a small emergency department on wheels, capable of caring for an average of three stretcher patients in addition to several ambulatory cases. The MERVANs emerged not as a planning concept, but to fill a recognized operating gap.

A presumption that we came to realize was false was that our existence defined our mission; by 1970 EMS had become the centralized agency for pre-hospital care with official responsibility for the handling of mass casualties. While police and fire personnel knew there was an ambulance service, there was no perception of an EMS organization or a responsibility beyond that of transporting patients. We naively believed that our review of the Plan with Operation Division personnel of the Police Department would result in instant recognition. It did with the 3 or 4 high ranking officers in the Operation Division, but there still remained some 30,000 other police officers of all ranks. This kind of identity problem is likely peculiar to a very large city such as New York, but the need to have the missions of those involved in MCI response recognized and accepted is not. Rather than attempt to educate all 30,000 police officers, we concentrated on apprising the higher

ranking members of the Fire Department and Police Department of our mission and capability as well as officials of other agencies frequently involved in MCI situations.

What became apparent over a number of years was that the interdepartmental cooperation at the management level was often based on a personal recognition and acquaintance between EMS administrators and Police, Fire and other officials. While we have said that an emergency plan should designate people by title or category and not individual names (since the named individual may be unavailable), actual experience indicated that familiar faces were far more important than titles. In terms of subsequent planning, informal emphasis has been placed on exposing higher ranking EMS personnel to their counterparts in the other public safety services. That one should have to consciously build familiarity and recognition between fire, police, and EMS supervisory personnel may seem ludicrous to those in smaller cities or regions where such familiarity is a natural phenomenon. But in the kind of large scale incident where this recognition counts, the smaller city or region will be receiving help from "out-of-town" – from county, regional or state sources. While familiarity has been said to breed contempt, it may in fact breed cooperation and should not be overlooked.

Perhaps the most constant reaction that we noted was the tendency for first responders to remove or to try to remove patients from a mass casualty scene. The feeling of helplessness that initially confronts the rescuer faced with real or apparent multiple injuries is invariably replaced by a reaction to do as much as possible as quickly as possible, which generally translates into victim movement intra-scene and away from scene. In some instances, such activity has no significant impact on patient outcome. This does not excuse it. Increased mortality and morbidity are always potential consequences of inappropriate action. Our whole objective is to minimize these, regardless of time or circumstance.

To combat this, we felt, required the establishment of EMS command and control as quickly as possible. In practice it generally has not been possible to effect this in situations where instant casualties have been produced. The relative sparsity of EMS supervisors and resources does not permit sufficient volume of rapid response compared to police and fire or related personnel. On the other hand, where casualties are not produced immediately, it is possible to effect EMS control. It has become clear that personnel of the Police and Fire Departments, as well as others in specific situations, i.e., transit and airport rescue personnel, must be trained to provide basic triage and immediate care. Further, they must be taught the principles of mass care as well as the objectives sought at the scene, in transportation, and in hospital delivery distribution. This training is not only to enhance the value of their own patient care roles, but to prevent inappropriate action by "civilians" on the scene. At one recent MCI scene a bleeding patient was quickly placed in a taxi only to exsanguinate prior to reaching the hospital. Had even basic measures been taken, this life would likely have been saved. Immediate control of patient care at the scene is an absolute necessity, a necessity of which we were well aware, but which experience has taught us is difficult for EMS to achieve rapidly. Therefore, this control must be exercised by those response agencies which arrive early *and* in sufficient force.

The number of MCIs producing a significant volume of patients – significant is hard to define but, arbitrarily, will be used for 25 or more – is small, perhaps no more than half a dozen a year in New York City. Yet, the number of potentially significant or initially reported as significant is far greater, perhaps one hundred a year in our experience. This is a wide ratio. On the other hand, initial information not infrequently minimizes what in fact

becomes a significant incident. How to prevent over or under response was a dilemma that we faced. Whereas delayed response, awaiting accurate information, resulted in delayed care and control, over response resulted in unnecessary utilization of resources, removing them, if only temporarily, from on-going emergency calls or emergency department care. Hospital staff particularly resented frequent "dry" runs. Our early experience indicated that initial reports were frequently inaccurate, and often remained inaccurate for considerable periods of time. This experience has not altered greatly in spite of improved communication links.

In order to provide dispatch supervisors with reasonable response guidelines, we evolved an automatic response plan of personnel and units, and hospital notifications. This plan relieves the dispatch supervisor of "second-guessing" at a time when he is least able to do so, and results in a quick response of a small number of units and supervisors. The response can, of course, be escalated at any time. MERVAN response which involves the sending of hospital staff is automatic in only a few instances, thus minimizing their unnecessary utilization.

Basically an MCI is defined as any incident which is reported as having produced 5 or more injuries, or by its nature is a potential cause of mass casualties. Included under the latter would be explosions, building collapses, major fires, major transportation accidents, riots, and hostage situations. Major fires (second alarm or greater) average two a day, and account for the majority of the approximate one thousand MCI responses annually. Multiple casualties are not produced in the majority of major fires, but an MCI response is maintained not just for the potential injuries, but for practice as well. Since at least one EMS supervisor responds to all MCIs, it provides continuing experience for them in terms of working with personnel of other agencies, and in practicing communications and ambulance control procedures. Such incidents therefore, serve as continuing "real" drills for field supervisors, ambulance crews and central dispatch supervisors and dispatchers. The degree of familiarity and experience gained is a great asset when dealing with the incidents that indeed do produce mass casualties.

When the Disaster Medical Plan of the City of New York was prepared in 1968, it relied heavily on a rapid physician–nurse response to effect triage and supportive care. One problem already noted was the lack of patient care facilities at the scene, a problem solved, at least in part, by the MERVAN vehicles. Experience, however, has lead us to question the practicality, and even the need for physician–nurse response, particularly in an urban setting. Our feeling is that paramedics (Advanced EMTs) have the skills needed for both definitive triage and supportive care at the scene. They can respond more quickly in greater numbers, and are used to the field environment, and the other rescuers working in it. In comparison the response of MERVAN can be half an hour or more because of the time required for physicians and nurses to free themselves from their emergency department assignments. Secondly, the physicians are generally house staff members with little or no experience at multiple casualty scenes, as indeed may be the nurses. Finally, the first MERVAN responding will likely be from a hospital about to receive MCI patients, and to strip, even partially, the hospital staff, particularly during off-hours, is counter productive. Medical teams have been effective in those situations in which the MERVAN has been used as a standby medical facility, generally at a fire with a relatively slow and controlled rate of patient flow. In these instances, however, paramedics could probably provide the needed level of care. Since New York City has only begun to develop an advanced EMT level pre-hospital response system, little experience exists, but we would expect that in a few years physicians and probably nurses will be replaced on the MERVAN units by paramedics, and the phy-

sician's role will be voice medical control from the confines of a base hospital.

Another difficulty that was faced on numerous occasions was the role of the ambulance crew as patient "treaters" versus patient transporters. A subway crash in 1970 illustrated this difficulty. Arriving ambulance crews descended to the tunnel and began providing aid to patients who were then moved to the street by other rescue workers. Since the ambulance crews were not with their vehicles, patients had to remain on the street awaiting transport. In this instance, transport was delayed in order to provide initial treatment. The opposite also occurred frequently when patients were placed in ambulances as they arrived on the scene. Unfortunately, the least serious patients were generally the first to be brought out by fire or police personnel, resulting in quick transport of those who needed it the least, and no initial care, and often delayed transportation, for those who needed it most.

An ambulance crew must therefore know on its arrival whether it will be used primarily for treatment or transport. This is not difficult once command and control have been established, but is a problem in the early stages of MCI response. Which role the early arriving ambulance crews take will depend to a large extent on the training and capabilities of the first responders, whether police, fire or other public safety personnel. If first responders are trained as EMTs, EMT ambulance personnel can concentrate on patient care during transportation. If first responders are not trained, or if ambulance personnel are trained to the advanced level, their efforts should be initially directed at triage and patient care. In this instance, ambulances are "deadlined" until such time as decisions based on patient need for transport are made. The advantage to having first responders trained in initial care is obvious, and underscores the need to include fire, police and similar personnel in EMS related training, and to identify the roles expected of them.

Communications are a key to successful MCI response. Communications refer not just to the ability to exchange information at the time of an incident, but to a continuing dialogue between those who are likely to be involved in MCI response. As was mentioned earlier, discussing the newly promulgated Citywide Disaster Medical Plan with the New York City Police Department was in no way sufficient communication to result in operational cooperation. This has been achieved reasonably well now through repeated communication at various levels – the kind of communication that evolves into a first-name basis. This kind of familiarity needs to be bred with those most likely to be involved. This is not to say that an MCI is a social gathering, but the operation also cannot be run as though it were a recipe from a cookbook. Flexibility of action and direction is required, and this flexibility is much easier to attain if those in charge can communicate in the broad sense of the term.

Since the inception of the Plan, EMS has greatly increased its communications hardware, and therefore its ability to exchange information. We did not require operational experience to convince us of the need to communicate on the scene, between the scene and central dispatch, and between the scene and hospital. But the ability to do this was contingent upon funds to construct an EMS Communications Center, to purchase mobile and portable transceivers, and to obtain sufficient radio frequencies. Until we had these capabilities, however, we did not realize the extent of their importance.

One operating procedure we found necessary was the channeling of all information to one on-scene Communications Center. This process eliminates conflicting or duplicative requests, and minimizes misinformation. Direct MCI scene to hospital communication has been eliminated, since the inception of the EMS Communication Center. Experience showed that direct communication between MERVAN

professional staff and their base hospital often resulted in duplication or conflicting efforts when a hospital administrator attempted to "run" the scene via radio.

With the exception of direct or open line instruments, we have found the telephone to be a cumbersome method for MCI communications. Attempts to call a hospital or emergency department during an MCI are fraught not only with the frustration of trying to get through, but once having done so, to identify to the answering person's satisfaction the legitimacy of the information or request being given. Radio or direct hard line communication obviate both of these difficulties.

One factor in MCI planning that is briefly worth mentioning is the maintenance of "routine" emergency care during an MCI. In the natural excitement that accompanies a major incident, resources tend to be committed en masse with neglect of other medical emergencies occurring concurrently. The person experiencing a myocardial infarction is no less deserving of care because of a subway accident a mile away. The system that cannot respond to this patient is derelict, particularly if, as usually happens, some or even many of the MCI victims have not suffered life threatening emergencies. What has the EMS system accomplished if it commits its resources to caring for lacerations and fractures while the heart attack victim goes into ventricular fibrillation awaiting help that is not forthcoming or is considerably delayed? Our attempts to counter this were the relocating of ambulance to cover for those in the MCI area. Unfortunately, in this geographically complex City, relocated ambulances were often unfamiliar with the areas to which they were called to cover. Our eventual solution was to have them respond instead to the MCI, releasing some of the locally based units back to their normal areas of coverage.

Many would probably question the relevance of experience in New York City with respect to other cities or regions. Certainly New York is not a typical city in size and great concentration of people. But the unforeseen problems we have encountered, many of which have been mentioned to a greater or lesser extent in this article, are not unique to New York. One may question the practicality of depending on experience for the development of an effective MCI response when a region experiences a significant MCI only every year or two, or perhaps every three or four years. This degree of exposure limits the extent to which scene experience can be a factor in developing an effective response system. But multiple exposure is not the sole determinant of experience. While each significant incident engenders some new problem, the major problems were ones that we recognized early on. One does not have to respond to a dozen incidents to discover that the regional MCI plan is faulty.

Where repeated exposure becomes beneficial is judging the adequacy of fault correction. It may take 3 or 4 incidents, for instance, to develop good, first responder activity, or to develop effective communication coordination. Theoretically, a region with a high number of MCIs will take as long, in terms of the number of incidents required to develop a certain level of proficiency, as the region with a low number of incidents. Thus each progresses at the same rate in terms of benefit to the MCI patient. In actual fact, the increased frequency in the high MCI level region is a distinct advantage, since the reduced time between incidents enhances knowledge, retention and skills. Nevertheless, there are other means of gaining experience. One, of course, is learning from others. Hopefully, some of the experiences mentioned in this article will be helpful to those concerned with MCI response. Unfortunately, there is not yet an extensive array of literature on the subject of MCI handling, but with the interest in emergency medical care that has developed in recent years, such will emerge.

THE DISASTER DRILL

Somewhere between one's own experience and that of others elsewhere, is the drill or practice session. The drill, in our experience, is not a good test of ability to provide quality care. With experience -- and again one needs experience to have effective drills -- drills can, however, be an effective method of testing logistics and coordination. They are a rehearsal of roles within a group, i.e., EMS, and between groups, i.e., EMS and police personnel. They are a means of testing communications, and a means of developing those ever so valuable interpersonal relationships.

The use of drills in expanding one's ability to provide good MCI care is almost an art itself. Drills held infrequently, i.e., a year or more apart, have little meaning because there is no continuity between them – the time is too long to effectively carry over the positive, or alter the negative factors of the previous drill. Frequent drills, on the other hand, (without intervening actual MCI incidents) tend to make participants very good in practice. The danger is that they become so well trained in the artificial setting that any significant deviation from it, as is likely to occur in a real incident, confounds them. With a little imagination, the drill setting can be multi-varied to the point where participants do not know what to expect.

A method that will diversify drills is to arbitrarily select a real incident that would not qualify as an MCI, but respond to it as though it were. This provides the elements of surprise, and spontaneity, as well as some of the excitement that accompanies the true large-scale incident. Obviously this type of exercise requires care in execution. The concept is similar to our automatic EMS response to second alarm fires described earlier.

For too long a time the community disaster drill has been regarded as an annual or bi-annual event that "we really have to do". It is regarded with the same enthusiasm as we at one time gave the dreaded visit to the dentist. Similarly, responsibility for the bi-annual hospital drill has been relegated to the most junior administrator and when held is more for "the record" than any other purpose. It is clear that much greater attention must be given to effective simulation of mass casualty care as a training mechanism.

SUMMARY AND CONCLUSION

The planning and development of effective operations for the provision of quality care to mass casualty victims involves several different processes, and considerable time. The total process is difficult, and even partial perfection is all but impossible to obtain because of a number of barriers that are related to the rarity of mass casualty incidents in any given region, the diverse groups of rescuers and medical personnel that are involved, and the psychological impact that mass casualties have on rescuers (an off-shoot perhaps of lack of MCI experience).

Before expecting to have an effective MCI response, those responsible for regional emergency medical care must develop an effective "routine" emergency care system, at both pre-hospital and hospital levels. The EMS system that offers acceptable care, but barely so, on an everyday basis, will provide less than acceptable care under the stress of an MCI. Once confident that a solid EMS system is in place, attention should be directed towards the formulation of a simple and flexible plan for the care of mass casualties. It is important, in fact crucial, for this plan to be based on medical care objectives, and therefore to have the input of physicians and nurses with extensive emergency care experience.

That the plan developed does not "work" effectively when first tested should be cause for neither surprise nor discouragement. Our experience in New York City, where we faced many MCIs of varying severity, proved that operating experience was the most important factor in developing an effective response. The cause of the strongest impediment to effective

initial care was the lack of training in MCI management and patient care by the invariable police and fire first responders. While it is easy to assign first responder responsibilities in a plan, it is quite another task to see that the responsibilities are carried out. Over a period of a year, perhaps a little longer, after the promulgation of our disaster plan, we experienced virtually all of the factors that we have recognized as being the difference between what we planned or wanted to happen, and what did occur. Correction of the deficiencies may or may not be as rapid or as simple as their recognition. While we have been pleased with the increased quality of our MCI response, some major defects remain; a result of not what has to be done, but how to do it amidst many other priorities.

Few regions have the kind of exposure to MCIs as we do in New York City, hence they are limited in gaining operational experience. Nevertheless, one can capitalize on what does occur, as well as utilizing the experience of others such as ours in New York. Further, the utilization of drills, designed in perspective, can be most valuable in developing many of the elements of effective MCI response.

In assessing or planning MCI response, consideration must be given to the nature of the incident. While those in EMS have a right to take pride in any operation where quality patient care is the end product, we should distinguish between those scenes where it is readily possible and those where it is all but impossible. Consider two settings – the one, a collapsed building with 50 live victims, freed from entrapment over a three hour period, on a temperate midweek morning, in an urban area with three nearby major medical centers; the other, a plane crash, early on a snowy Sunday morning, with the 50 live victims scattered over a half mile area, 50 miles from the nearest medical center. One should not get so pre-occupied with the latter type of incident that the former is overlooked, nor should one be content that a "job well done" at the former type of incident is necessarily indicative of a similar accolade to be deserved when confronted with a much more difficult incident.

MCI care is not a crisis issue. If civilian multiple casualty scenes are increasing in number, either in the United States or worldwide, the increase cannot be dramatic. Under the circumstances MCI care has probably not been bad, or certainly any worse or better than emergency medical care in general. This is not to suggest that the circumstances referred to should not be altered where possible to permit improved care, or that we should be content with poor MCI care whether or not "routine" care is good or equally poor. MCI care is a response of the broad EMS system often with some additions, and that is why first attention must be paid to the development of that system. On a national scale we are doing just that, making it now feasible to in turn begin to look at effective mass casualty response. Those who are beginning to do this must first realize that an MCI is not just a larger-than-usual accident; it has its own characteristics and creates special problems. Planning by those who are familiar with, those who have experienced these characteristics and special problems is essential if effective response, and hence the objective of prompt quality medical care, is to be achieved.

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A BACKGROUND NOTE ON THE PRELIMINARY FINDINGS AND IMPRESSIONS OF THE DRC STUDIES*

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Late in 1974, the Disaster Research Center (DRC) proposed a study of the delivery of emergency medical services (EMS) in large scale disasters in the United States. The objective of the research was to establish the nature and parameters of the characteristics of, conditions for, and consequences from the efforts to provide EMS in catastrophes and major stress situations. This study was seen as involving intensive and extensive field work on community health care systems. The empirically based findings were perceived as having important implications for general EMS training and education and as suggesting guidelines for the planning of the organization and delivery of disaster-related EMS.

In May, 1975, funds were awarded by the Health Resources Administration of the United States Health, Education and Welfare Department to initiate a two-year study beginning on June 1, 1975. At the time of the publication of this article, this research will be terminating a four-month extension of the work having been granted. What follows is a general discussion of the overall study, indicating something of the theoretical, methodological and substantive backgrounds of the DRC research.

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Since the study was the first of its kind ever undertaken, there were few guidelines to follow in developing a research design. For example, even what theoretical frameworks ought to be brought to bear was initially unclear. The attempt to test any explanatory theory about the conditions affecting the delivery of EMS services in disasters was considerably handicapped by the almost total absence in mid-1975 of any factual knowledge about the sheer characteristics of the phenomena. Who participated in the delivery of disaster-related EMS, when and how they got involved, what they did and similar kinds of questions, lacked any kinds of answers. Thus, it was necessary to obtain the simplest kind of information to even begin to be able to characterize typical and atypical features of EMS in disaster situations.

From a methodological point of view, it was possible at first to conjure up all kinds of data which ideally ought to be collected. But realism quickly imposed itself on the DRC research when very early it was discovered, for example, that few hospitals had adequate enough record keeping procedures to provide very accurate or detailed information about their intake of patients in normal everyday EMS operations, let alone during the stress of a disaster when, frequently, all pretense of patient intake record keeping is generally abandoned. This eventually led DRC to design,

reproduce and provide a standardized emergency patient intake record form for one major American city so that all the hospitals in the community could collect this most elementary data for their own internal everyday use, as well as for DRC research objectives.

Substantively, too, decisions had to be made about whether certain assumptions about EMS were warranted and what should be emphasized in the data observations and gathering. For example, DRC initially assumed that some kind of local EMS *system* existed in the communities studied, but it quickly became clear that the existence of any kind of social arrangement constituting something that could be called a *system* had to be treated as problematical and had to be established in each instance, rather than be taken as a given in all situations. It was also soon obvious, to cite another example, that our initial objective to establish the consequences or outcomes of the delivery of disaster-related EMS services had to take second place to the depiction and clarification of the actual system processes involved in attempting to provide EMS in disasters. For the most part, EMS research has so far failed to contribute even good systematic descriptions of the social processes which take place within the EMS system operating under day-to-day conditions, let alone how these may alter in time of disasters.

None of the indicated theoretical, methodological or substantive problems were easy to solve in the real world context of disaster responses in which the DRC research was undertaken. Some of the problems were never totally satisfactorily solved; for instance, what to use as a good indicator for the quality of the EMS care provided. Such advocated measures as response time seemed dubious in light of the field discovery that in mass casualty situations, the less seriously injured typically received treatment before more seriously injured victims. On the other hand, acceptable, if not perfect, solutions were evolved for other problems. For instance, instead of attempting any kind of systematic sampling, it was found a "snowball" technique of tracing down informants frequently allowed DRC to locate all the major groups and agencies involved in the transport of most victims to hospitals.

It is not the purpose of this paper to present research findings, since this is done in the five papers which follow. Rather, it is to discuss in more detail some of the steps taken and decisions made during the course of the DRC research which might be useful as a background context for understanding the empirical observations set forth. What follows is a description of some of the more salient aspects from the start of the DRC study to its current phasing out.

After an extensive review of prior DRC work in the health-medical area and the existing literature on everyday EMS, an early decision was made in the course of the DRC research effort to use an open system theoretical perspective. This required the obtaining of information from multiple sources within and outside a variety of local EMS "systems"; in all, about four dozen different community systems were studied. In almost all events studied by DRC, it was standard to interview personnel from all hospitals, ambulance services, fire and police departments, and whatever other agencies might be involved in the finding, transport and initial treatment of actual or potential mass casualty victims. More than 1,000 interviews were obtained, most with operational personnel, such as the particular ambulance drivers and emergency room nurses involved in the crisis situation, although predesignated key decision makers, such as hospital administrators and disaster committee chairpersons were also automatically contacted. The refusal rate was less than 5 percent in the total study.

Similar, open-ended but semi-structured, interview guides which tapped system and behavioral dimensions were used in almost all the events examined. A consequence of this was that in practically all the disaster events covered, it was possible to reconstruct how the

vast majority of casualties who reached hospitals were found, transported and generally treated in the process of being given EMS. Concurrently, standard information was routinely obtained about such matters as overall community disaster plans, interorganizational linkages, agency experiences with mass emergencies and other factors which might affect the effectiveness and efficiency of EMS responses in mass emergencies. Overall, then, the quantity and quality of the data DRC obtained was such as to allow, in the final phase of the research, a significant testing of the applicability of the open systems model to the delivery of EMS in disasters.

Of course, what is important about the open system perspective is that it implies that there is some sort of whole whose components have to adjust to one another, to the whole and to the environment of both. But, as it is currently used in the social sciences, open or general systems theory is not as much a theory as it is an analytical perspective or dynamic model, providing general concepts and processes by which to depict and analyze social behavior. To apply the perspective, and for this theory to have explanatory power, substantive theories and concepts must be derived which are relevant to the phenomena being analyzed. The derivation of these substantive elements and the specification of relationships between them was, in fact, a major objective of our research.

The following five research articles indicate some of the specific dimensions or substantive concepts of the open system model which was applied in our research. However, these papers are substantive pieces which deal with specific questions and problems in disaster EMS delivery rather than with the overall problem of the response of open systems to stressful environments. Therefore, they only implicitly convey the overall theoretical model of service delivery on which the DRC research was based. An explicit formulation and depiction of the open systems model used by DRC is set forth in an upcoming DRC publication. Thus, while each of these five research articles is written to be able to be read of its own, each will undoubtedly be more understandable when its basic theoretical underpinnings are made more explicit.

At present, systematic and quantitative analyses of the data gathered are being undertaken. For example, 16–20 major disasters studied are being systematically compared with respect to a series of practical and theoretical system variables on which DRC has standardized data. A coding scheme is being used to quantify and analyze such general dimensions as hospital response, transportation response, transportation modes, disaster site data, non-hospital medical response, previous disaster experience, general community EMS information, history of EMS in the community, centralization and specialization of EMS response, and relevant inter-organizational communications and other linkages. With each general category, other more specific information is being quantified and analyzed. As only one example, key variables influencing hospital responses are being coded and quantifed. Among these categories are: *disaster plan* (e.g., existence, activation, termination, etc.); *casualties* (e.g., total, nature of injuries, admitted, transfers, DOA's, etc.); *patient flow* (e.g., duration, modes, first arrivals, most serious arrivals, mode of arrivals, numbers arriving by different means, etc.); *hospital notification* (e.g., how, content of message, information from disaster site, etc.); *disaster impact on hospital* (e.g., loss of different utilities, damage to hospital, necessity of evacuation, etc.); *adequacy of resources* (e.g., personnel, equipment, supplies, etc.); *change in hospital activities* (e.g., record keeping, surgery, X-rays, counseling, security, communications, medical diagnoses, etc.); *hospital characteristics* (e.g., relationship to disaster site, location, occupancy rate, categorization, funding source, etc.); and *emergency room characteristics* (e.g., staffing, communications, shifts, etc.).

Because of the importance of certain of the findings and their implications for EMS planning, a decision was made not to await the

final quantitative data analyses before reporting some of the results. Many of the observations reported in the following five articles are therefore based, for the most part, on initial qualitative impressions and limited quantitative analyses. Nevertheless, it is not anticipated that the final reports of the research will differ substantially from what is reported in the five articles in this journal. The only difference will be that the later observations will be rooted in much more systematically analyzed and quantified data.

The importance of publishing preliminary findings also means that only part of the data gathered in the DRC 29-month study could be used for the five research articles in this issue. The final reports on the work will include analyses of the full body and range of the data obtained. Again, it is not anticipated that the initial substantive impressions reported in this journal issue will be materially altered in the final reports, but a broader range of topics and questions regarding EMS in disasters will be addressed than it was possible to examine in just five articles.

As already noted, the basic open system theoretical model used in the research will be fully set forth. In addition, in an attempt to convey the flavor of EMS in stress situations, several detailed case studies are being prepared. One, for example, is of a single hospital in a massive disaster, and another compares EMS preparations in two events with very high potential for disasters. Still other papers will address such topics as "A methodology for evaluating disaster-related EMS" and "Factors affecting the distribution of victims in mass casualty situations."

Other studies will have to be undertaken before it will be possible to arrive at a conclusive judgment as to both the scientific merits and policy implications of the overall worth of the DRC work on EMS in disasters. However, the DRC research, whatever the ultimate judgment, would seem already to have three important accomplishments. First, the work shows that it is possible to go beyond the purely descriptive case study approach, which was almost the only disaster-related kind of EMS research undertaken up to a few years ago. By using a theoretical framework and systematic data gathering procedures to study a variety of mass casualty situations, general findings and observations applicable to the generic problem of EMS in disasters were obtained. Second, the DRC work was a pioneering effort of its kind. Future studies, therefore, instead of starting at ground zero, will be able to build upon its substantive findings and observations and to learn from its successful and unsuccessful methodological procedures and theoretical ideas. Third, and perhaps more crucial, the DRC work raises some fundamental questions about basic assumptions which underlie planning and thinking about disasters in most of the EMS sector of the health community in American society. If any of the major substantive themes of the DRC studies reported in this journal issue are valid, serious thought will have to be given to a major policy reassessment of the whole question of providing EMS services in disasters and other kinds of mass casualty situations.

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EMS DELIVERY IN MASS EMERGENCIES: PRELIMINARY RESEARCH FINDINGS*

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INTRODUCTION

For the past two years the Disaster Research Center (DRC) at the Ohio State University has undertaken a systematic and comparative study of the delivery of emergency medical services (EMS) in large-scale, relatively sudden mass casualty producing situations in the United States. During this time DRC has conducted field studies of twenty-seven mass emergencies in twenty-two communities, spanning fourteen states, the District of Columbia, and the U.S. Virgin Islands and has gathered baseline data in a number of other U.S. cities. Field research has consisted of three kinds of studies: baseline or Time One, studies used to gain information on EMS disaster planning and normal EMS operations in six disaster-prone U.S. communities; on-the-spot research of five preplanned events, such as the Mardi Gras in New Orleans and the July 4 Bicentennial Celebrations in Washington, D.C. and Philadelphia, Pa., where the possibility of excessive casualties was anticipated; and studies of Time Two operations, or the EMS response in twenty-two mass casualty events. Included in this last category were both natural disasters (six events) and technological disasters (sixteen events). Disaster agents included four tornadoes, two floods, eight transportation accidents, one major fire, and seven explosions and toxic leaks. Often, more than one trip was made to a community by DRC personnel, so that knowledge could be gained concerning EMS operations in pre-, trans-, and postdisaster settings.

Approximately 506 interviews were conducted in the course of this research, and there were perhaps twice that number of informal contacts with personnel of emergency organizations. Additionally, extensive documentary data was obtained from emergency department logs, newspapers, and disaster plans, and thousands of hours of observation were performed.

This paper will discuss: (1) the substantive issues and theoretical focus of this research; (2) the data-gathering strategies employed in these studies; (3) some preliminary findings derived from the cases which were studied; and (4) some implications of these findings for EMS planning and operations.

THEORETICAL FOCUS AND SUBSTANTIVE ISSUES

DRC research has focused upon EMS as an open-system response. According to this view, all organizations involved in the various phases of patient care in disasters are seen as interfacing and acting in a more or less integrated

*The research on which this paper is based was supported in part by PHS Grant 5 R01 HS01781-02 from the Health Resources Administration.

fashion to deliver services. System imagery was used in this research for several reasons. First, this parallels the approach used by DRC in the study of other aspects of community disaster response; for example, the reaction of the group of organizations collectively termed the "political system". Thus, the EMS system was viewed in this research as one of a set of community systems which could become active in the pre-, trans-, and postdisaster settings. Another advantage of the adoption of the concept of system is that its use requires that attention be paid to the environment or context in which a group of organizations operates. EMS delivery in mass emergencies is seen as being affected by both internal system factors and factors external to the system, including other community systems. Finally, the concept "system" was employed because of its wide currency in the health care disciplines. Indeed, system imagery is becoming increasingly common in many areas of scientific study, from biological science (Miller, 1965) to social science (Buckley, 1967).

Use of imagery from general systems theory had implications for the research design. For example, it required that close attention be paid not to the capabilities of specific EMS system subunits, but to the overall capability of the EMS complex. Similarly, the relationships and the dynamics exhibited by subunits – two system characteristics – were focused upon more than, for example, structural properties of a single subunit.

Three basic topics were pursued throughout. First, there was an interest in determining the pre- and transdisaster *conditions* affecting disaster-related EMS delivery. Second, the research sought to determine the nature and the range of the medical services delivered in mass emergencies – the *characteristics* of disaster-related EMS delivery. Last, there was an effort made to discover the *consequences* of disaster-related EMS for the emergency health care systems involved.

METHODOLOGY

DRC's focus on gathering comparative data on sudden mass-casualty producing events, together with its use of the interorganizational, open-systems theoretical model, dictated a research strategy that was both distinctive and appropriate. Essentially, three things were required. First, a large number of cases, exhibiting a variety of system characteristics were needed. As indicated, there was a wide range of cases, both in terms of disaster agent and of community type, present in the sample. Studies were undertaken in communities as small as 5,000 as well as in several major American cities. Communities at all phases of EMS development, from those with only the most rudimentary capability to those with sophisticated systems, were included in the research. Second, field teams had to be present on the scene as soon as possible. In preplanned events such as Mardi Gras, teams of researchers were on hand before and during the event. Third, in order to understand system organization and functioning, it was necessary to have contact with key EMS officials and operational personnel in a variety of emergency health care organizations. In-depth, open-ended interviews were conducted with persons responsible for a number of tasks related to EMS delivery in mass emergencies: hospital administrators; hospital personnel responsible for disaster planning; physicians, nurses and other medical staff; providers of ambulance and other transportation services; persons involved in normal and disaster EMS communications; providers of emergency first aid; and others. Documentary and statistical information, both on EMS operations during the disaster period and on normal operations, were obtained. Observational data, obtained on-site by field personnel, was invaluable as a source of information about the reliability and validity of data obtained by other means as well as information about the reality as opposed to the ideal of EMS delivery in high demand situations.

RESEARCH FINDINGS: EMS DELIVERY IN MASS EMERGENCIES

Earlier analysis conducted by DRC on data collected in pilot studies indicated that a number of factors appear to contribute to a viable EMS response in disasters. These factors include: preplanned linkages among hospitals; understood relationships between ambulance services and first-responders, e.g. police and fire departments; predisaster professional ties among key EMS personnel; and a clear division of labor among those groups and organizations responsible for the various phases of care. Field work during the intensive phase of the research was intended to validate, strengthen, and make more specific these and similar generalizations.

Analysis of data from the more than two dozen studies conducted to date has served as the basis for the findings discussed below.

EMS Planning for Mass Emergencies

1. Few community health-care systems have undertaken realistic overall planning for handling large numbers of casualties. Most planning and operational personnel assume that the everyday EMS system can be extended in mass emergencies and that a system which functions adequately during normal times will also do so in disasters. Interviewees frequently espoused this view; in fact, it is commonly argued by EMS professionals on all levels that everyday and disaster EMS are simply two points on the same continuum. DRC research indicates that this is not the case. Mass emergencies create demands that differ qualitatively and quantitatively, from everyday EMS demands. For example, disasters can create large numbers of "walking wounded" who, while not necessarily requiring the services of a hospital emergency room (ER), may nevertheless intensify demands by converging on hospitals. Indeed, convergence of press, relatives, medical personnel, etc. presents a major problem in disaster, as opposed to normal, EMS delivery. Another distinction between everyday and disaster EMS is that the former is designed to function with great speed in meeting the specialized problems of sick and injured individuals, problems such as cardiac arrest and multiple trauma. In disasters, which produce large numbers of casualties whose medical problems exhibit different degrees of urgency, speed of the response may not be crucial to effective operations; instead, the overall coordination of the response – among hospitals, between first responders, hospitals and the transportation component, for example – becomes the essential task. DRC research indicates that the EMS system which actually functions in disasters is, at least in part, an emergent system, different in many important respects from the everyday EMS system. (See Worth and Stroup in this issue for a lengthier treatment of EMS in disasters as an emergent system response.)

2. There is a widespread lack of knowledge about the overall EMS system in many communities, even within subunits of the system itself. Only a few officials appear to recognize this as a problem, and even these are uncertain regarding how to go about diffusing greater knowledge. Where mass emergencies are concerned, attitudes of either faith or fatalism are prevalent. On the one hand, there is a faith that necessary assistance will be forthcoming from some quarter in situations of extremely high EMS demand; on the other, there is in some communities a fatalistic notion that some disasters are probable to which there could be no effective community response, for example, a massive earthquake in California.

3. Political considerations enter into all aspects of EMS planning and response, even in disaster. Self-interested organizational actions based on city/county, public sector/private sector, and other jurisdictional distinctions are common. Interviewees throughout the nation repeatedly singled out as problematic a number of EMS matters over which various interest groups differed. Examples of these include:

funding issues; participation by private hospitals in publicly controlled EMS systems; categorization of hospital emergency departments; the use of telemetry and the rendering of certain forms of treatment to victims by EMT's or paramedics on site or during transport as these relate to the possibility of later legal action; and the issue of patient accessibility to care.

Communities frequently assume stands either for or against the use of federal monies in the design and operation of EMS systems. The issue of federal intervention in local affairs was raised in several of the communities studied, and it is probably safe to assume that the funding question influences perceptions on EMS in every community. The application for, or the granting of large amounts of money, however desperately needed, frequently signals the beginning of intense conflicts at the local level.

These kinds of disputes are important to note because they can result in a lack of inter-organizational cooperation, or even outright conflict, which can eventually have a greater impact on disaster planning and/or response than does the magnitude of the resources available to the system. Conflict can reduce the extent to which resources such as EMS expertise, communications equipment, and transportation vehicles are used effectively when required.

Additionally, mass emergencies seldom occur in politically convenient locations. Any number of organizations and agencies on a variety of governmental levels may feel compelled to act in an emergency situation. Often, overlapping jurisdictions lead to confusion in service delivery, loss of coordination, and patient treatment that may be less than satisfactory. (For a good analysis of this phenomenon, together with illustrative case studies, see Neff, this issue.)

EMS Operations in Mass Emergencies

1. Accurate on-site assessment of the need for EMS almost never occurs. The large geographic scope of some disasters, a lack of adequate security and rumor control at the site, the atmosphere of uncertainty and urgency that prevails in disasters, and the absence of personnel trained in recognition of emergent and urgent medical cases are all factors that can hamper efforts towards accurate needs assessment in the first moments following disaster (Golec and Gurney, this issue). Very frequently the need for personnel and emergency transportation vehicles is overestimated, leading to dysfunctional mass convergence at the disaster scene and to a diminution of EMS coverage in other, non-stricken areas.

2. Meaningful on-site triage and initiation of treatment is seldom attempted in disasters and mass casualty situations, in spite of the comparatively large numbers of "walking wounded" which are produced by such events. Lack of adequate on-site triage and first aid results in several problems, particularly for hospitals: emergency departments become overcrowded; treatment may be initiated on the less seriously injured in the ER, just as critical patients begin arriving; casualties may be treated or admitted simply because of their involvement in the disaster, rather than because of the severity of their injuries. The rendering of hospital emergency care in disasters to those who do not require it is too often at the expense of patients who do.

Studies of on-site triage and treatment in preplanned events such as Mardi Gras and the Bicentennial celebrations indicate their effectiveness in relieving the distress of those sustaining minor injury and in lessening demands on ambulance services and hospital emergency departments.

3. Poor intra- and inter-organizational communications are common in disasters. Despite the emphasis in many communities on notifying hospitals of the imminent arrival of patients, hospitals are still quite likely to receive no word that a disaster has occurred until the first stream of patients arrives in the

ER. Ambulance-to-hospital and hospital-to-hospital communications linkages are seldom utilized effectively. This failure to communicate is not always due to a lack of communications facilities per se. Rather, factors such as a lack of experience in utilizing communications equipment on an everyday basis, absence of trained personnel, equipment failure, confused or distorted messages, critical communications gaps (e.g. site-to-hospital), and information overload, combine to reduce communications effectiveness.

Particularly in the area of EMS communications, DRC has found an *overreliance* on technology and a failure to appreciate the fact that effective communications are most likely to occur where organizations have already established cooperative relations in the areas of planning and operations. The existence of a radio network cannot bring into being a workable division of labor where one does not exist, and it is the value of the latter that communities often fail to realize.

4. Extrication, transportation, and distribution of victims of mass emergencies leave much to be desired. In part, this is due to the tendency, present to some extent in everyday EMS operations, but even more marked in disasters, for initial victims to be found by non-medically-trained personnel. First responders frequently make decisions for patient transport and distribution which are detrimental to the quality of medical care. Inaccurate needs assessment, lack of triage, and poor communications, mentioned above, interact with problems in the transportation/distribution task, and all of these together produce undesirable effects. For example, the majority of disaster victims are transported to hospitals by means of private vehicles which are not linked to any EMS networks, almost always resulting in maldistribution of casualties. This pattern obtains almost everywhere, even in communities where sophisticated central dispatch systems exist. As Worth and Stroup note elsewhere in this issue:

> While the existence of central dispatch can ameliorate convergence because whereabouts of the vehicles is known, the participation of groups and individuals not normally associated with EMS delivery may alter the complexion of the transportation process. . .

Another pattern presents itself in almost all communities regardless of the degree of sophistication of the EMS system: one hospital – usually the hospital closest to the disaster site – receives the largest number of casualties, the most severely injured, and the largest number of DOA's. Golec and Gurney (this issue) illustrate this pattern by citing the following two cases among others: in one community, 125 of a total of 140 casualties were seen at one hospital, out of a possible total of 17 hospitals; and in another community, of a total of 45 casualties, one hospital received 25, all in conditions serious enough to require admission as "serious" or "critical", while three other hospitals received the other 20 patients, 14 of whom were admitted, but in "fair" to "good" condition.

A third significant pattern observed in many mass emergencies is that the *less* severely injured patients are transported first and arrive at the hospital relatively soon after the incident, while the *more* severely injured may arrive at any time during the first few hours. This pattern, attributable at least in part to a lapse in coordination in the first moments following the disaster event, has obvious consequences for the hospital phase of patient care.

5. In some instances, although by no means in the majority of cases, DRC has found that the care given to regular hospital patients during the trans-disaster period may fall below acceptable standards because so much attention is given to providing EMS to disaster victims. For example, in one case studied, several staff members left a coronary care unit (CCU) to render services to disaster victims in the emergency department; there were two fatalities in the CCU that same night, and informants at the hospital attributed the deaths directly to this lack of supervision. This point is noted

because few hospital disaster plans consider the question of regular patient care in precipitous mass casualty situations.

6. There is a tendency for EMS deliverers to give relatively little attention to standardized record keeping – one of the fifteen EMS components – during everyday operations. This tendency is even more marked in disasters. This not only causes problems in tasks such as patient identification and billing, but also makes it difficult for EMS personnel to observe the ways in which EMS demands in a disaster situation differ from everyday demands. Additionally, if systematic evaluation of EMS is to be attempted by EMS systems, accurate and complete records are essential.

7. Centrally coordinated EMS responses are rare in mass emergencies. This seems to be true particularly in incidents producing large numbers of casualties, in very large communities, and in communities where interorganizational expertise is scarce. The size and complexity of a community's resource base also appear to affect the probability of a centralized response. Seemingly paradoxically, presence of a *larger number* of resources, say ambulances, made a centralized response less likely. One possible explanation for this is that communities which are richer in resources do not coordinate well during normal operations, because this is not crucial for adequate service delivery; thus, they are not able to effect a centrally coordinated response in mass casualty incidents (Wright, this issue). Centralized responses, where actualized, do seem to make for effectiveness in EMS delivery, where effectiveness is defined as equitable distribution of seriously injured patients among several hospitals.

Post-Disaster EMS Activities

Research findings indicate that EMS organizations are beginning to institute mechanisms, such as group critiques and after-action reports, for learning from their disaster experiences. In some locales community-wide disaster drills are being staged. This constitutes an improvement over earlier drills, which tended to include single system components or at best a few system subunits. As these practices become more widespread perhaps recommendations based on disaster critiques and drills will influence hospital and community-wide disaster planning. Additionally, if different EMS systems would share disaster experiences with one another, knowledge about useful innovations, operational problems, and the like, could become more widely known.

The above observations are based on preliminary impressions. More systematic analysis of the data is underway, and other field studies have either already been completed or will be carried out. No major changes in findings are anticipated as a result of this later work, but refinements in or qualifications to these observations are a possibility.

CONCLUSION

While the foregoing comments seem to paint a bleak picture where disaster-related EMS planning and operations are concerned, the impression should not be left that EMS delivery in disasters is always inefficient and ineffective or that it has not shown improvement during the past few years. On the contrary, there are positive aspects of EMS in mass emergencies that should not be ignored. For example, key officials and operational personnel in a few EMS systems are beginning to recognize the fact that mass emergencies present EMS demands which are different from those presented during normal operations.

Disaster planning and response has been recognized as a specialized problem for EMS systems, indicated by the fact that "disaster linkage" constitutes one of the fifteen EMS components. Moreover, DRC research indicates that the establishment of disaster linkages among EMS components may lead to increased cooperative interaction among system subunits during normal times. If used advantageously, this cooperation could serve as a corrective

for some of the competitive and conflictive relationships that often obtain in EMS systems on an everyday basis.

Another positive outgrowth of well-informed EMS planning was evident in the preplanned EMS situations studied by DRC. New relationships, often involving new organizations, were operative in these settings. Distinctive emergent EMS systems functioned quite adequately in caring for nonacute cases and in reducing the demand on EMS components responsible for the care of true emergencies. It is unfortunate that thus far the implications of EMS delivery in preplanned events for disaster-related service delivery have not been recognized. (See Taylor and Tierney, 1977, for a detailed discussion of the organized delivery of EMS in two Bicentennial celebrations.)

Finally, DRC research has led us to the conclusion that most confusion and gaps in EMS delivery in disasters can be ameliorated by means of increased communication, interaction, planning, and cooperation among EMS system components. Major financial expenditures, massive reorganization, or the creation of new technologies are not essential to the launching of a good disaster response. Of course, this is not to argue that more EMS resources are not needed in many communities; indeed, in certain areas the need for resources such as transportation vehicles and trained manpower is so great as to render ineffective even everyday attempts at EMS delivery. Rather, this statement calls for a final reiteration of one of the important distinctions between everyday and disaster EMS. Sophisticated, expensive EMS technologies, such as telemetry, have undoubtedly improved everyday EMS delivery. Likewise, faster response times have improved the life-saving capacity of EMS operations. Yet as our research has indicated, effective EMS delivery in mass emergencies is often less a matter of swiftness and technology than of good overall coordination. Thus, even cutbacks in EMS funding may not *necessarily* have an adverse effect on a community's chances for effecting an adequate EMS response to a disaster.

In sum, particularly in the area of mass emergencies, there is great potential for increased EMS organizational effectiveness if organizations learn more about human and group behavior in disasters, plan together, share existing resources, and develop a workable division of labor for disaster operations.

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SOME OBSERVATIONS ON THE EFFECT OF THE EMS LAW ON DISASTER RELATED DELIVERY SYSTEMS*

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INTRODUCTION

Natural disasters and mass-casualty situations present extraordinary contexts for delivery of emergency medical services (EMS). Not only is there an increased demand for services, in terms of caseload, at the point of entry into the emergency medical system, often at the same time and place; but the capabilities of the system are tested in terms of the degree of effectiveness and efficiency with which components are able to coordinate and mobilize their resources to meet that demand (Taylor, 1974). These capabilities are tested at a time when various agencies are often pursuing their own primary tasks, which may be peripheral to the usual demands of EMS, such as the provision of shelter, fire protection and traffic control. Agencies involved in these tasks, in addition to private citizens and other organizations, may hamper coordination with day-to-day EMS providers (Quarantelli, 1970). A breakdown in one or several components of that system – agencies or organizations designated to deliver a particular service – may result, at worst, in the ineffective operation of the system (Stallings, 1970).

The purpose of this paper is to examine the hospital-medical area of EMS care in mass casualty events in localities *prior* to the establishment of federally funded EMS systems and *after* funding became available. We will explore the extent to which issues and problems involved in EMS delivery have been addressed since the passage of the federal EMS Act, and describe how EMS operates in disasters. Concluding comments will suggest changes in operations which might make for more efficient patient care and will focus on the distinctiveness of EMS delivery in disasters and other high-demand settings.

METHODOLOGY

Levels of analysis for each mass-casualty event include the disposition of individual cases as taken from hospital records, pre-hospital phases of EMS organizational involvement, hospital EMS, and the community context.

Data are from both documents and interviews. The pre-EMS Act data are from nine cities: five struck by tornadoes; two by explosion-fires; one by flood; and one disaster-prone from the years 1963–1974. More than

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650 interviews with professional and administrative staff from 35 hospitals and numerous public safety agencies were recorded and analyzed.

The latter data span 11 mass casualty events in six states from 1975 and 1976. In this area, three were the result of tornadoes, three of explosion-fires, three were transportation disasters, there was one flood and one fire. Two hundred twenty-five interviews were conducted at 43 hospitals and numerous public safety agencies. Hundreds of documents were used as supporting material. Data were gathered by field workers from the Disaster Research Center (DRC) at Ohio State University.

Federally funded EMS systems include a disaster linkage component which addresses the whole complex of mass casualty care by calling for an EMS system plan which is linked to local, regional and state disaster plans and for participation in exercises to test disaster plans (*EMSS Guidelines*, 1975). Our analysis focuses on selected aspects of EMS systems – communication, transportation, treatment and identification of victims, and coordination – in response to mass casualty care situations in the context of disaster.

Data in the following sections will describe the subsystems as they operated in disaster communities prior to and after the introduction of federally funded EMS systems.

COMMUNICATIONS

From the standpoint of hospitals, the communication process is both internal and external, involving not only discovery of and notification about a mass-casualty emergency, but the continued transmission of information on the situation among and within organizations such as other hospitals, police and fire departments, the Red Cross and Civil Defense. How then do hospitals learn they are in a mass-casualty emergency situation and how do the hospitals inform their staffs? How is information communicated regarding the emergency room (ER) capacity, diversion or transfer of patients, needs for personnel and supplies?

Modes of notification vary depending upon the resources available and the nature of the disaster agent. Our data indicate that, in the flood and tornadoes, hospitals were generally notified by public safety agencies. Other means of notification were first arrival of casualties, public radio and sightings. In the explosion-fires there was no formal warning before the first casualties arrived, but telephone notification occurred shortly thereafter. It should be noted that tornadoes and floods generally have a longer warning period.

Although individual hospital disaster plans designate who is to report for duty and where, many hospitals reported convergence of staff and volunteers who were not requested, or inability to locate key personnel. Contacting staff by telephone was often complicated by jammed switchboards. Within the hospital some paging systems were not on emergency power and were ineffective when power failures occurred. In one instance, local television was used to request staff. In one city, National Guardsmen performing security tasks did not recognize nor honor staff identification and prevented personnel from entering the hospital area.

In no case was there an effective, direct communication linkage from the disaster site to the hospital. In a few cases either ambulance–hospital or hospital–ambulance linkages existed, but rarely was there any two-way communication. Contact with public safety agencies was available in a few cases through Civil Defense or citizen's band radios, but more often was nonexistent. In some cases, hospital–hospital communication existed via radio, and in a few others by telephone. Nearly all hospitals reported that telephone lines were jammed or disrupted. In one city, hospital A phoned hospitals B and C to send extra personnel to hospital D whose phones were jammed. Had direct communication with

hospital D been possible, hospital A would have learned that extra staff were not needed.

In all but one city, a central communication system was lacking. In the city where such a system existed, the linkages between the hospitals and other emergency organizations were weak and unspecific. In effect, the existence of equipment did not guarantee its effective use; in cases where it was unfamiliar, manpower to operate it was lacking or power failed.

In the post-EMS communities we still find instances of hospitals informed of a mass casualty situation by the first arriving casualties. Here again, this was generally the case where there was little or no warning that a disaster had occurred. In one city, despite the existence of six radio networks for EMS, there was no direct hospital–hospital or ambulance–hospital communication, and the fire department which owns the ambulances notified other EMS components by phone. In another city, despite the existence of three communications centers designed to notify EMS components, one center failed to communicate at all. In another case, a city with an emergency radio network was able to effect two-way communication with hospitals and ambulances and to call in specialists, but one of the hospitals was notified after the first casualty arrived, and one receiving hospital was not included on the radio net.

One state experienced four mass-casualty situations, but its statewide communications system, not geared to disaster conditions, was utilized inconsistently. In city A, the ambulance association was not notified of the disaster. In city B no site–hospital communication could be effected, and separate police and fire radio networks and dispatchers caused coordination difficulties. In city C the ambulances are equipped with two-way radios to police and hospitals. Although one receiving hospital was on the state network, no trained operator was available at the time. In addition, no one was listening to the police emergency radio, and the hospital switchboard lost its power. On the other hand, in city D four radio networks are available, and the state patrol provides the key link to all EMS components. One hospital monitoring the weather radio was prepared for receipt of casualties, communicated with the state network and with volunteer ambulances, and did not experience an overload of patients.

While communications capabilities are improving in many cities, lack of experience with a mass-casualty situation, lack of consistency within network linkages, and the failure to initiate communication at the crucial moment still cause breakdowns in the process.

TRANSPORTATION

The transportation process is involved with two separate but related functions: dispatching aid in the form of vehicles and personnel to the site, and transporting the victim from the site to a facility where care is given. In the transportation area, some important questions are: is there central dispatch? who is notified of the need for help? who transports the victims and how is it decided where they will go? who transfers patients?

There was no evidence of a central dispatch to link the transportation and communication processes in the pre-EMS law data. For the most part, fire and police ambulances were either called for or arrived voluntarily at the scene and transported patients to the nearest hospital. In many situations, ambulance drivers were asked to divert less critical casualties to other hospitals. In one city, nearly twice the number of casualties were taken to the nearest hospital, a private facility, than were taken to the general hospital with the best ER facilities.

A major problem in this phase of care is the transporting of patients by private vehicles which are not tied into an EMS communications or transportation network, frequently resulting in maldistribution of casualties. Here individuals take on the responsibility for

transportation to treatment facilities because they are ready and available to transport, often before ambulances arrive or because they want to carry family or friends themselves. Many victims walk to the nearest facility. In one city taxis and chartered buses already at the scene of a disaster commenced transport of casualties to hospitals.

Due to lack of data, we cannot generalize about transportation life support capabilities. Although some personnel had first aid training, it seems the majority of casualties in all cities were not transported by vehicles with equipment and personnel meeting current EMS expectations. In addition, it should be emphasized that not all vehicles dispatched for *aid* are capable of *transportation*, such as some fire rescue units.

In the case of transfers, data lean toward transport by ambulances and private vehicles. Transfers either require intensive care units elsewhere or require treatment for minor injuries, in which case transfer both relieves convergence and is relatively safe for the patient.

The transportation process in the post-EMS cities was facilitated by central dispatch in only two communities, and hospital overload was prevented in both. Those communities without central dispatch experienced problems such as convergence of ambulances to the site – however, Emergency Medical Technicians (EMTs) did search and rescue – autonomous response by city and county vehicles with separate dispatch centers, shortages of vehicles and squabbling over EMS transportation responsibility. In one case, 50 casualties were transported by bus to one hospital, and in another case many victims walked to the nearest hospital which ultimately received 125 of the 140 casualties in the disaster. While the existence of central dispatch can ameliorate convergence because whereabouts of the vehicles is known, the participation of groups and individuals not normally associated with EMS delivery may alter the complexion of the transportation process unless these are made subject to coordination. For example, the 50 casualties transported by bus could have been dispatched in coordination with the ambulance services to avoid hospital overload.

TREATMENT

Treatment may be trichotomized into on-site care, initial emergency room care and definitive care. Pertinent questions include: who takes care of the casualties at each stage? are they trained personnel? are the casualties triaged?

The need for on-site treatment was met in a few cases with a professional response. In one disaster, three treatment sites, staffed by six doctors and 15 nurses, were set up. In other cases, help arrived too late. Triage at the site was not evident; emphasis seemed to be on moving the patient to the nearest hospital. This was accomplished for the most part by untrained individuals.

Professional ER staffs existed in some hospitals and materialized in others without regular ER coverage. In many cases, the disaster's occurrence at shift change allowed for all those in the hospital to aid in the EMS response. In others, the occurrence of the disaster during a slack shift necessitated the request for additional staff. Convergence of both volunteers and staff to the ER area generally was encountered. Poor traffic control and lack of security outside hospitals sometimes were problems in that they either inhibited staff accessibility or eased outsider accessibility to the ER.

Teaching hospitals which received casualties were often at an advantage in utilizing their student nurses or medical students to augment patient care. However, one problem encountered in using those not normally on the staff was their unfamiliarity with the facilities.

Since the majority of hospitals had little prior knowledge of how many or what cate-

gories of casualties to expect although many have agreements with organizations to receive such information, numbers and specialties of professional personnel were contacted as the emergency progressed. Available physicians were not able to treat solely according to specialty. Fractures, lacerations, contusions and some head injuries were the major injury types. These require the abilities of orthopedic surgeons and neurologists whose services were available in some cases but were seriously lacking in others. Casualties may arrive in a steady flow, or in clusters. X-ray departments were frequently used to full capacity and sometimes understaffed, and one hospital reported "sloppy" X-rays. Of 120 casualties received in one hospital, 110 were processed directly through the X-ray department with no prior ER care. Another hospital received 53 casualties, nearly all of whom required treatment for smoke inhalation. In most cases the sudden convergence of casualties at a hospital requires that noncritical patients be selectively discharged. Data indicate that many times it is nurses who make the initial decisions toward this end.

At least five of nine cases reported performing triage in the ER, directed by medical staff. In one hospital, separate entrances were set up for ambulatory and more critical cases according to disaster plan. Another hospital waited 45 minutes for a trained person to initiate triage. After triage, patients were sent from the ER to the proper care area or transferred to another facility. In two cases, outpatient clinics were used to handle those less seriously injured. The criteria for transferral to another facility were seriousness and type of injury and age of the casualty.

On-site treatment was handled in various ways in the post-EMS law cities. In those having central dispatch with EMT response, one experienced no site triage or tagging while another administered treatment on site, lessening the hospital load. In the latter city, EMTs stabilized the injured and transported them to a single hospital where the decision to transfer patients could be made. In one of the explosions some on-site treatment was reported but no triage for hospitals. The Red Cross treated on-site in one community. When a medical team was denied entry to one site, emphasis was shifted to removal and transportation. Another city reported triage where there was no site–hospital communication.

In a flood community there were 1,000 recovery-work casualties, and four first-aid stations were established. EMT-staffed ambulances were available in addition to Navy and National Guard medical teams. However, minor injuries were usually treated at homes due to a special nursing program that provided widespread first-aid instruction.

In terms of distribution, several hospitals reported convergence problems. Two said they were overloaded initially but were large enough to absorb the quantity; one complained of poor distribution of nonserious injuries; another received the first 24 casualties simultaneously, which included all the critically injured; and one triaged out the less serious to an adjacent clinic. Casualties still were generally taken to the nearest hospital. Several hospitals set aside routine procedures, stressing patient care as the primary goal.

IDENTIFICATION

The identification process in a mass-casualty situation generally serves four purposes: naming of the patient; recording the injury sustained and other relevant medical information; facilitating the billing procedure; and fulfilling the demand for public information.

Some of the problems encountered with identification of patients were, a shortage of tags (one hospital resorted to use of paper towels), unfamiliarity with the color coding, lack of carbons, and the small size of tags. In the hospital morgue tags sometimes were attached to clothing rather than the body of the victim, and personal effects were mislaid.

Some tags were not designed to include other medical information such as drugs administered, allergies, etc., and sometimes victims were too seriously injured to supply data. Frequently nonmedical personnel were assigned the task of tagging, and in cases where medical records personnel were involved, normal billing activities were suspended. Where there were insufficient data on the tags, billing and insurance collection were nearly impossible. It was reported that noncritical cases occasionally left the hospital after initial care still wearing their tags. One hospital, however, evidenced noninterrupted standardized record-keeping and tagging simultaneously.

Scant data on identification, on definitive care and on convergence of volunteers, staff and media to the hospitals precludes generalizations in these areas for post-EMS cities. This is also the case in the area of facilities; thus the following section considers pre-EMS cities only.

FACILITIES AND SUPPLIES

Generally there was no formal categorization of hospitals in the nine cities, but in some cases informal categorization was implicit. Several hospitals had plans, in the event of a disaster, to expand the ER area into the orthopedic clinic, labor rooms, surgical recovery unit or physical medicine department. One hospital called for moving the entire ER to a larger area of the hospital. Convergence problems were particularly acute at one facility which has four separate ER entrances.

Several hospitals needed extra blood during the emergency, but all seemed to obtain ample supplies. Occasionally shortages were noted in the areas of dry clothing, stretchers and suture sets. At one hospital at least, requisition of drugs was informal as routine paperwork was suspended; in others, "cold" sterilizations were necessary.

In the cities struck by tornadoes, loss of water pressure and electrical power occurred, disrupting some hospital service. In a few cases, emergency power was not tied into the paging system, X-ray developers and elevators. These unforeseen circumstances also precipitated coordination problems. Telephone service was inconsistent because switchboards were jammed.

We have little data on definitive care given those already hospitalized at the time of the disaster, and to those admitted as a result of the disaster. In the flood case, the only instance of serious damage to a facility, two hospitals had to evacuate entirely. According to prior plan, a satellite hospital was set up for relocation of their patients. The resulting transfer resulted in a loss of continuity in physican–patient relations, but it is difficult to assess the consequences to patients. In another city, 37 in-patients, one of whom died later, were evacuated by tunnel to an adjacent dormitory.

COORDINATION

Although coordination certainly includes linkages involving transportation and communication most importantly, it may be conceptualized as a complex of cooperative, harmonious action among the various processes we have described. Good coordination should take the victim through the EMS system efficiently and effectively. As we see, there are many possible pitfalls, ranging from competition across geographical boundaries to the absence of a hospital triage officer during a mass-casualty situation. Problems of coordination are magnified during a disaster but not solely because of the greater number of casualties. While the same tasks need to be performed, it is the emergence of different organizational linkages that makes disaster EMS delivery different from day-to-day operations.

In the communications process, unusual modes may be sought when normal channels

fail. When telephones are no longer functional because of power loss or jamming, runners or radios may have to be utilized. Not only is there difficulty in receiving reports from various agencies, but the added problem exists of communicating with hospital staff, both externally and internally.

Demands by police or fire department, the Red Cross or hospital public relations, whoever is responsible for information dissemination, make standardized record keeping qualitatively different from day-to-day activities. Numbers of cases and the immediacy of the demand for a center to inform media and families about casualties were problems in many hospitals where there was no planning for this contingency.

In transportation, a lack of central dispatch hampers coordination. Blockages of regular hospital routes due to damage, damage to vehicles, and the intrusion of the private sector into EMS delivery may also complicate matters. Coordination with public safety agencies is imperative, since they tend to suspend normal activities in disasters. In one city, a fire department near the site made immediate arrangements with departments in four surrounding communities to assume fire protection duties for the duration of its commitment to EMS delivery.

In the area of treatment there are a number of variations from day-to-day activities: triage may be called for; tagging procedures may alter normal record-keeping procedures; ER facilities may need to be expanded or moved; supplies may be overtaxed; power and water failures may necessitate improvisation; in-patients may need to be discharged early to make room for more admissions; internal and external security becomes problematic; and convergence of casualties, the media, families, staff and volunteers can create confusion in the ER.

Administrative coordination frequently is more of a problem than is professional coordination. As one administrator noted, "I'm sure that the professional service is much more integrated informally than administration." In another city, it was noted that nurses trained in patient care but not in command and coordination of duties showed initiative in these areas when the situation demanded. One administrator saw individual initiative as both the answer to and cause of coordination problems within the hospital.

One hospital respondent articulated the frustration involved in coordination this way:

> I had all this personnel and all these volunteers who are just as good as Red Cross people... and there was no way that I could get that talent into the system. I sent them over to the Red Cross... and they had no need for them... so back they came and asked me if they could go out on the ambulances because they could at least start the IVs. I sent one to go with each ambulance crew which is composed of two people, but I don't think anybody got to go because the ambulance crews were coming and going... maybe on a one-time run and weren't coming back this way. The hospital operator would say a helicopter is dropping off a patient and how can I get an ambulance there, so when they would bring some patients in, I would commandeer the ambulance and tell them to go pick up a victim at so-and-so and they wouldn't know where it was. I had to send a med student with them for directions... The police and fire networks had their own problems but we didn't have an emergency net between ambulance and hospital, hospital and hospital, aside from phones which were knocked out in some areas. It was a total waste of personnel.
>
> It saddened me there was no communications... they couldn't get physicians or patients in or out of there except by helicopter. They needed personnel, supplies, and I had all the stuff that I could have given him. We had nothing to do after a while. There was just no way to be sure that if you went somewhere you wouldn't be told to turn around and go back home.

In cities where a more structured EMS system existed during the last two years, we may ask whether the same problems have been adequately addressed or whether new problems have emerged. And we may also ask, does the day-to-day EMS emphasis adequately address the delivery of EMS in disasters?

Despite greater sophistication in equipment and training, all EMS delivery processes cannot function smoothly without coordination. Some individual or organization must be in charge, particularly at the site, and the linkages

between processes must be explicit both in theory and practice. Data indicate the lack of a coordinator or coordinating body still is a problem. In one city which seeks central coordination, not all EMS providers are represented and the various components seem to be unfamiliar with each other. In another, the regional trauma coordinator was not involved in the disaster, leaving Civil Defense and the fire department the task of coordination, which was complicated by overlapping jurisdictional boundaries.

In other instances, the abundance of resources, rather than their paucity contributed to coordination problems. This may be seen as an old problem wrapped in new technological ribbons. The combination of several radio networks in a community and the response of greater numbers of people and vehicles, in addition to an autonomous response by groups in different jurisdictional boundaries, put enormous strains on coordinating efforts. In some cities, however, coordination, at least between the communication and transportation processes, has improved with the addition of radio networks and central dispatch. Coordination between transportation and treatment has likewise improved with the addition of EMTs. The hospital phase of the response obviously depends strongly on the degree of efficiency with which the preliminary, or prehospital processes of EMS are delivered.

A disaster situation in one city resulted in a shift from placing demands solely on EMTs to the inclusion of other nursing and supervisory personnel. In another situation, role conflict occurred, and the position of regional EMS director was temporarily filled by another person so the director could assume his post in a National Guard medical unit. The latter post seems to have taken precedence over the EMS function for that individual.

THE DISASTER LINKAGE

For most hospitals, the only formal acknowledgement of the possibility of a mass-casualty situation is the hospital disaster plan. While nearly all hospitals have a disaster plan, and while these plans are supposed to subsume disasters both internal and external to the hospital, most are written as if the hospital existed in a social vacuum. Few plans mention coordination or practice it with other hospitals, public safety agencies, other than security or traffic control, and other organizations that are apt to be involved in communication or transportation. Many administrators, while pointing out that disaster plans are necessary for accreditation concede that they are relatively unworkable in practice.

One administrator commented, "We do what needs to be done. We don't have to look at the plan." Another said, "I opened up our plan immediately after we got the note and it said that wards 4A and B would be the shock and resuscitation area for all victims. That's four floors up. I've got two old elevators that take forever to move up and I said, 'We're forgetting the disaster plan completely, this is the way we're going to run it,' and we ran it from that point on our own... The tornado hit the affluent part of town. Had it hit the poor section, I doubt if those hospitals would have activated their disaster plans. The general hospital would have had to handle the entire load. That's just the way society is."

Many plans seem to be tied to hospital "personalities," in whose absence coordination falters. Besides lack of recognition that different linkages from those operative in normal EMS situations will be involved in disasters, plans are generally written that disregard convergence. Seldom is it mentioned that families, staff and media will congregate or attempt to communicate with the hospital during the course of the emergency, nor are procedures designed to cope with it.

Disaster drills generally were internal, but community-wide drills which point up coordination difficulties are becoming more frequent. Seldom are non-day-to-day EMS deliv-

erers or volunteers designated as "media" or "families" included to fully test convergence potential and the linkages that are nonroutine for most hospitals. Disaster critiques of internal drills are often more congratulatory than critical in nature, although one disaster critique said that major errors, weaknesses and problems existed in ill-defined lines of command, communications and coordination. But community-wide drills, while having the potential to elicit response from more segments of the community, sometimes have the added burden of attempting to correct weaknesses without causing permanent ruptures in the working relationships. Mass-casualty experiences often result in disaster plan revision, however.

The EMS Systems components' disaster linkage addressed the whole complex of mass casualty care by calling for an EMS System plan which will link to local, regional and state disaster plans and participate in exercises to test disaster plans (*EMSS Guidelines*, 1975). Early data on post-EMS cities indicate this has not yet been accomplished.

COMMENTS

Since the EMS law is in its infancy, few communities have had sufficient time to develop comprehensive plans. Additionally, few communities have seen their efforts seriously tested in a mass-casualty situation. But for those in our sample, many of the same problems still exist in the disaster context and must be planned for.

For example, during a disaster communication linkages need to include organizations other than those directly involved in EMS delivery such as Civil Defense, sheriff, National Guard and weather bureau. While it is not economically feasible for communities to plan for all possible contingencies, telephones should not be relied upon as the sole means of communication. The use of a radio network with two-way capacity to all components and trained, available personnel to use such equipment is imperative. But failure to respond to pre-arranged procedures or to notify some component is courting reduced efficiency. In practical terms, notification of a disaster by arriving casualties hardly affords a hospital the lead time required to make preparations. Hospitals still are plagued with inadequate estimates of arriving casualties and unequitable distribution of patients.

Contingencies for face-to-face communication also must be anticipated both inside and outside the hospital. Access to the hospital must be facilitated at the same time that security is being maintained and it must be done quickly. Under disaster conditions, this process may well be the province of a non-EMS provider.

On-site mobile communication and coordination with the transportation process can reduce hospital convergence. It must be emphasized that the response of private citizens, which is not a feature of day-to-day EMS delivery, is omnipresent in the disaster setting and is an elusive feature to coordinate. If not controlled on-site, this segment of response is likely to escape coordination altogether.

The pattern of transportation to the nearest treatment facility, while a seemingly logical one, highlights the need for formal categorization. Awareness by EMS deliverers and the public of a facility's potential may lessen both convergence and the necessity to transfer patients to other intensive care units (ICUs). This may have less relevance in the rural disaster context where there are fewer options in treatment facilities. In this case, hospital–hospital linkages may need to be stronger than in the urban setting.

In terms of treatment, the nature of most injuries in disasters would seem to indicate on-site care. But the reality is a convergence of minor injuries to ERs. With increasing numbers of nonemergency patients already clogging emergency facilities, it would be reasonable to strengthen the capability of on-site care, not

as a *pre*-hospital treatment but as an *extra*-hospital service. Some hospitals have attempted to initiate triage team services on site, with varying degrees of success. In addition to stabilizing the more serious injuries on site, the expansion of paramedic programs may have a positive effect on the elimination of minor injuries from the ER. Legal and financial guidelines should be conducive to such care.

In conclusion, the distinction between everyday EMS care and EMS in disasters needs to be emphasized. Definition of EMS as a system which provides for the arrangement of personnel, facilities and equipment for the effective and coordinated delivery of health care services in an appropriate geographical area (Findeiss, 1974), under emergency conditions has been geared to the notion that if a community response is not adequate for the sick or injured *individual*, it cannot cope with a disaster. "Individual care" and "mass-casualty care" are seen as opposite ends of the same continuum. The rationale is that since every contingency cannot be provided for, a flexible system to cope with both extremes is the answer. Disasters are often regarded as an extension of day-to-day EMS, as a "more of everything" situation. But, as the foregoing discussion indicates, disasters present circumstances which are *different* in *more complex ways* than sheer *numbers* of casualties.

Sophistication of equipment and personnel has been sought following EMS guidelines, including telemetry transmitting physiologic information, for example. In most disaster situations, however, such equipment is *more* sophisticated than required. The day-to-day operations have different demands compared with the lax definition of emergency injuries in a mass-casualty context. For many of those "involved" in a disaster, their injuries, however minor, make them a part of the event and therefore subject to treatment. In a non-disaster context, the same injuries might be treated at home, if not subject to insurance claims. As we have previously noted, equipment and personnel may not be utilized to full advantage; a broader range of potential EMS deliverers and organizational links than exists under normal conditions may emerge during a disaster; and coordination of personnel, equipment and facilities is more seriously tested and seemingly more illusive on site.

Coordination in its simplest form may be a matter of eliminating confusion among people and groups who have never worked together before, but this potentiality must be anticipated by planning groups. Interaction is not limited to the same number or types of organizations or individuals in a disaster. The "Good Samaritans," specialty surgeons, social services, National Guard, clergy and media may all interface with EMS in an emergent way. While there is no way to plan the location where a disaster will strike and to cover all possible situations, planning organizations should broaden the definitional parameters of potential EMS deliverers to effect better coordination and cooperation.

Few communities have developed an EMS system to a high level of efficiency, and until this is accomplished, the philosophy that disasters are an extension of day-to-day EMS cannot be fairly evaluated. A full development of the concept of systemization with its goal of an effective and efficient delivery of EMS may go far in coping with disasters but may not eliminate the typical "snafus" we have described unless these differences are not only recognized, but also incorporated into planning.

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THE PROBLEM OF NEEDS ASSESSMENT IN THE DELIVERY OF EMS*

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INTRODUCTION

The assessment of a community's health needs generally and emergency health needs specifically is understandably carried out according to the normal, everyday situation and not to the disaster situation. Furthermore, such assessments are based upon certain population characteristics and utilization patterns of existing community health facilities. While these factors have some, although indirect, bearing on the delivery of emergency medical services during a disaster, they are totally inadequate as guides for assessing the disaster emergency health needs. Such assessment requires, indeed demands, an examination of the population affected by the disaster agent.

Assessment of emergency health needs during a disaster is, in practice, neglected. The basic problem any Emergency Medical Services (EMS) must face is how to quickly and accurately assess needs. If this fundamental fact which underlies the following discussion is correct, it is certainly paradoxical.

In part, the raison d'être for EMS planning is to facilitate the construction of EMS delivery systems based upon an accurate assessment of emergency health needs and an equitable distribution of victims among existing community health facilities during mass casualty and disaster situations. In fact, most community and hospital EMS disaster plans implicitly or explicitly assume that needs assessment *will* be carried out. However, few plans actually specify who has the responsibility for such assessment, exactly how needs assessment at the site is to be done, and what criteria are to be used. Finally, the popular and widely used concept of triage at the site incorporates the notion of needs assessment and attests to its importance. Unfortunately, on-site triage, when it is done, seems to be limited to an evaluation of the condition of an individual patient rather than of the situation as a whole.

The negative consequences of failing to assess emergency health needs at the disaster site are experienced by hospitals. In American society hospitals have the primary responsibility for emergency medical care. But, the assessment of emergency health needs is only one side of the equation in estimating the total magnitude of a disaster in terms of EMS for any given community. The other side of the equation is at least a rough estimate of the current capabilities of the hospitals. The magnitude of the EMS demands for the system depends upon the extent and severity of the emergency health needs relative to the current capabilities of the hospitals. Obviously, an equitable distribution of casualties among the

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different hospitals would reduce the demands upon any given hospital and would increase the efficiency and effectiveness of delivering emergency medical services to the disaster victims. What appears to be less obvious is that an equitable distribution of patients presupposes a prior assessment of emergency health needs at the disaster site. Consequently, it is the hospitals that experience the most severe effects when on-site needs assessment is neglected.

This discussion will be organized in two parts. First, the typical pattern of what occurs in hospitals immediately following a disaster will be explored. Second, in an effort to explain why needs assessment is neglected, we will examine the factors which tend to exacerbate problems in the assessment of emergency health needs at the disaster site. However, a short section describing the research on which this description is based precedes the two major parts and immediately follows.

METHODOLOGY

These preliminary findings are from a larger ongoing research project conducted in the United States by the Disaster Research Center (DRC) to study the delivery of EMS in mass casualty situations. Some findings of this research are reported elsewhere in this issue of the journal. The research project is divided into studies of three different types: the first monitors EMS activity in a number of disaster-prone cities; the second focuses on scheduled events that have the potential for producing a mass casualty situation; and the third examines the EMS response to natural and technological disasters.

The data reported here are from studies of the last type only, natural and technological disasters. A total of 18 disasters, occurring between May, 1975 and November, 1976 are included in this article. Of these, six are natural disasters, including floods and tornadoes, and twelve are technological disasters, including fires, explosions, plane and train crashes, traffic accidents and a dam break.

Disasters included in this study are not representative of all disasters which occurred in the United States over the specified period. Due to the research focus – the delivery of EMS in mass casualty situations – only those disasters that produced either moderate to large numbers of casualties or unusually severe casualties were included. Consequently, caution must be exercised in generalizing the findings from this study to other disasters which produce (as for example sometimes occurs in disasters in Third World countries) either few casualties or massive numbers of casualties.

Findings are based on three sources: (1) open-ended interviews with EMS, hospital and related health care personnel, including ambulance and search and rescue units; (2) official agency statistics; and (3) documented materials.

TYPICAL PATTERNS IN HOSPITAL RESPONSE FOLLOWING A DISASTER

In American society, the current trend to improve EMT training and equipment notwithstanding, there appears to be considerable agreement that the identification of the injured, first aid, stabilization of patients' conditions, and transportation of casualties are ancillary to the provision of sound medical evaluation and treatment in a hospital setting. Consequently, it is within the hospital that the effects of needs assessment at the site are most dramatically experienced. An examination of the typical patterns and general trends which occur in hospitals immediately following a disaster will provide some needed information with which to decide if a reconsideration of the problem of assessment of emergency needs at the disaster site is warranted.

The following general trends become evident from the 18 studies; though they recur frequently enough to be considered trends, they do not necessarily occur in every instance (see Table I).

TABLE I

Casualty Report on a Number of Natural Disasters

Disaster agent	Total number of victims or casualties	Dead on arrival (DOA)	Dead after arrival	Treated	Treated and released	Admitted	# of Hospitals Used/ # of Hospitals Available	# treated in *one* hospital/ total # treated in all hospitals used
Tornado	250	3	0	132	122	10	8/12	55/132
Tornado	62	3	0	59	43	16	1/1	59/59
Tornado	103	5	0	34	22	12	4/11	22/34
Tornado	155	2	1	155	121	15	2/6	150/155
Tornado	28	2	0	26	18	8	2/3	23/26
Flash flood	242	139		103	90	13	4/4	94/103
Casualty Report on a Number of Technological Disasters								
Train collision	140	0	0	140	124	16	4/17	125/140
Bus accident	45	0	1	45	17	28	3/3	27/45
Gas explosion	94	0	4	94	72	22	2/7	56/94
Bomb explosion	71	10	1	61	5	56	7/17	31/61
Multiple car pile-up	105	0	0	55	40	10	4/5	30/55
Train crash	398	0	1	398	277	61	11/105	207/398
Explosion	71	20	0	41	27	14	1/1	41/41
Fire	45	12	1	35	4	29	4/105	25/35
Plane crash	91	37	0	54	35	19	1/1	54/54
Tank explosion	204	4	2	200	142	58	13/26	84/200
Dam break	11	10	0	1	0	1	4/4	1/1
Explosion-fire	55	0	4	51	20	30	5/12	40/51

Hospital/Other as Primary Receiver of Casualties

Before preceding directly with the patterns between and within hospitals, it should be noted that the hospital is the overwhelmingly preferred setting for evaluation and treatment. Occasionally a secondary facility, such as a school or warehouse, is temporarily established to relieve the demands made on hospitals. Since generally 50–75% of the total number of casualties seen in a hospital emergency room (ER) are treated and released, this may represent a viable alternative mode of providing medical services in certain situations. This pattern, although rare, tends to occur:

1. Where the primary need of victims is shelter rather than medical aid. First aid or medical attention, then, is a secondary and accidental occurrence in extra-hospital facilities;
2. At a time considerably distant from the time of impact: many hours and sometimes days later;
3. When the area of impact is large with low population density, i.e. a flood, and when search and rescue may take days to complete;
4. Where the extrication of the more seriously injured and directly affected, i.e. in a multiple car collision, may delay efforts and require the most concentrated attention.

Inequitable Distribution of Patients Across Hospitals

One hospital typically receives an inordinately large number of casualties. Obviously, those communities which have only one hospital must be excluded from this pattern. However, even in this instance, a larger community which has a complex of hospitals that typically service the disaster community in a normal situation is generally only a few (15–30) miles away. Of the 18 communities studied 15 had more than one hospital.

The hospital which receives the most victims is usually that closest to the disaster site and the one with which the Emergency Medical Technicians (EMTs) and ambulance attendants have a close rapport during normal conditions.

Two examples will illustrate the range and magnitude of this pattern. Both were chosen because the communities typically experience more than one mass-casualty situation per year and have extensive and well-developed EMS systems.

Example 1. Of a total of 140 casualties seen in a hospital ER, 125, or roughly 90%, were taken to one hospital out of a total of 17 in the community. The remaining 15 were distributed among three other hospitals. This occurred despite the fact that the goal of this system is to prevent overloading any single hospital. A central communications center, with each hospital's ER capabilities and bed census on hand, was to redirect patients away from overloaded hospitals. Furthermore, the network was to notify the hospital of the disaster, but according to hospital officials it did not. Apparently communications, and therefore coordination, broke down.

Example 2. Of a total of 398 casualties seen in hospital ERs, 207, or roughly 50%, were taken to one hospital. A total of 105 hospitals are available in this city. 181 of the remaining 191 patients were distributed over four other hospitals.

Typically, one hospital receives not only the largest number of casualties but the most severely injured as well. Two different cases will illustrate this point.

Example 1. From a total of 45 casualties, one hospital received 25, all serious enough to be admitted and all judged to be serious or critical. Of the 20 remaining patients taken to three hospitals, 14 were serious enough to be admitted but all were judged to be in fair or good condition.

Example 2. Of 51 casualties, one hospital received 40, 30 serious enough to be admitted and 28 judged serious or critical. Of the re-

maining 11 patients taken to four hospitals none were judged serious enough to admit.

As well as receiving the most severely injured and the largest number of casualties one hospital typically receives the most victims dead on arrival (DOAs). In Example 1 above, one hospital received 25 of a total of 45 casualties, all of the serious or critically injured, and 10 of a total of 12 DOAs.

Even in those communities where a relatively large number of hospitals participate in the EMS response, the basic pattern of inequitable distribution continues to be observed. What we judge to be one of the best illustrations of an equitable distribution of the casualties between hospitals has been selected.

Thirteen hospitals participated in this EMS response. Four hospitals received 166 of the total of 200 casualties, i.e. hospital A 84; hospital B 46; hospital C 22; and hospital D 14. The remaining 34 patients were divided among the nine other hospitals which participated. In this illustration the serious injuries appear to be more fairly and equitably distributed (4-5-3-3-1-1) than one usually finds.

It follows logically from the above that when more than one hospital is involved in the EMS response, the secondary hospitals tend to receive fewer numbers of casualties, the less severely injured patients, and fewer DOAs. There have been several cases where more than one hospital is involved in the EMS response and the secondary hospitals become involved only after the first and/or preceding hospitals have been filled to capacity.

Time of Arrival Relative to Hospital Notification

In many instances the arrival of the first wave of casualties in the ER precedes or is itself the first notification the hospital receives of the disaster and the fact that it will be receiving casualties. The hospital may receive advance notification of the disaster through: (1) a large explosion or a dramatic change in weather conditions; (2) the hospital staff hearing the news over public media; or as in one case, (3) the weather bureau office being located in the hospital that was the primary receiver.

In only a few cases, however, were hospitals activated for preparation by official notification in advance of the arrival in the ER of the first casualties.

Flow of Casualties Through the ER

Casualty flow can be analyzed along two dimensions; volume and severity of the injuries to patients.

In respect to volume, three trends can be identified:

1. Time of onset – the first casualties typically arrive within the first half hour after the impact.
2. Duration of time over which casualties arrive – most casualties arrive in the ER over a relatively short period of time, i.e. one to four hours.
3. Peak of casualty flow – the largest percentage of casualties arrive in the ER within one to one and one-half hours following impact.

Example 1. Following an explosion which occurred at 9.30 a.m., 41 victims had arrived in the ER by 10.30 a.m.

Example 2. After a disaster which occurred at 7.36 p.m., 56 casualties arrived in the ER between 8 and 9.30 p.m., with the largest number arriving at about 9 p.m.

There may be more than one peak within the flow of casualties, depending upon how many are transported in any single vehicle. A commercial bus dropped between 60–70 ambulatory victims at one ER. Similarly, in another disaster, the first three vehicles arriving at an ER contained 5, 12, and 9 casualties, respectively. In this case, the onset of first arrivals constituted one of the several peaks in the flow of casualties.

The severely injured arrive at any time over the duration of the casualty flow, while the

less severely injured tend to be concentrated at an early phase of the casualty flow. A large number of ambulatory cases arriving before the severely injured can create problems in that the ER may become overcrowded, resulting in confusion.

The ambulatory casualties and those with relatively minor injuries arrive before the more serious cases when taxis, buses, private cars, vans, police squadrons, and fire rescue units transport the less severely injured in large numbers at one time. Ambulances usually transport the more severely injured with fewer people in each vehicle. Also, those severely injured who require extrication tend to arrive later than the less severely injured. When the severely injured are readily visible and free from falling debris or heavy structures they tend to arrive in the ER early.

Information Input to ER

It is generally assumed that a more effective and efficient response in any given ER will be facilitated by prior knowledge concerning the number of casualties to expect, the type of injury, and the severity of injuries. In the overwhelming majority of cases information regarding number, type and severity of injuries is non-existent, while in some cases, where estimates concerning the number of injured are available, they are grossly under- or over-estimated. For example, one hospital which received 28 severely burned casualties, as well as 12 other patients, had received a call from an anonymous source telling them to expect a "few burns." In another instance, a hospital ER which received 41 patients was anticipating a total of 80 casualties, a figure which was widely circulated.

Ongoing information is rarely, if ever, received through official EMS channels. Most information concerning the magnitude of the casualty situation comes via rumor networks – patients seen in the ER, ambulance attendants, police officers, etc.

EMS systems are supposedly designed to counter the trends previously discussed. However, it seems that these goals have not yet been achieved due to malfunctions at the point of entry into the system and the neglect of on-site needs assessment. Needs assessment is a rational model based on the relative conception of needs on the one hand and resources or capabilities on the other. Controlled and accurate information concerning these two facets must be present to accurately assess needs in a mass-casualty situation. In practice, needs assessment implies a system or at least a network with three fundamental requirements for efficiency and effectiveness:

1. An inventory of EMS needs which includes number of injuries, type of injuries, seriousness of injuries and projection of specialized treatment modes that might be required. This inventory should originate at the disaster site;
2. An inventory of existing hospital facilities;
3. Control over information by relatively centralized means of communication and coordination.

If done properly needs assessment should equitably distribute casualties, thereby reducing the magnitude of the demands made on any single EMS component. This in turn will increase the efficiency and effectiveness of the delivery of EMS to all victims.

FACTORS WHICH EXACERBATE PROBLEMS OF NEEDS ASSESSMENT AT THE SITE

An accurate assessment of needs requires temporary site stabilization so that an evaluation can be made. To accomplish this, either action at the site can be halted or victim removal can be controlled according to the severity of the casualty. Obviously, this necessitates that those making the assessment have control over activities and information.

However, there are several factors, intrinsic to the disaster situation, which interfere with assessing needs. Uncertainty might prevail

right after impact due to the debris which results from the disruption. Also, the geographical scope of the catastrophe can be a deterrent factor; the disaster site may be very large or there may be several disaster sites. Often extensive visible material damage leads to the assumption of mass casualties. The situation can be further complicated by a sense of urgency among the EMS personnel who believe that visible casualties represent only the tip of the iceberg.

In many cases the initial assessment, facilitated by a lack of rumor control is the one which prevails. Usually the system is originally advised by a public-spirited citizen with a report which is generally vague and almost always grossly exaggerated. This message activates the system and sets expectations for a casualty count of significant magnitude. Frequently this count is a wild guess, and the magical process of numbers is set in motion. This number is picked up by the press, circulated among agencies through rumor networks and seems to stick as reality.

Example 1. Nine minutes after a tornado hit at 3.18 p.m., an ambulance was dispatched to the scene by the communications center of the EMS. The EMT on the ambulance was told to observe, ask questions and report back. When interviewed, this EMT said, "As you just go around and see, everything had been levelled. I asked a couple of questions of people that were there and in their right senses. I estimated 150 people as being hurt. I radioed in and told them to send everything available – it's a big one." This assessment was made in two minutes, and ambulances arrived from all over the state. According to the EMS project director, this estimate was totally wrong, "Outside ambulances weren't needed, we had three times more than we needed." Many of these ambulances got flat tires and blocked the roadways.

Example 2. In one disaster, which actually produced one injury and ten deaths, injury estimates exceeded 1,000 shortly after impact. Incidently, that figure of 1,000 continues to appear in written reports to this day.

Generally police or fire personnel are the first on the scene. As a rule, they lack EMS training. These officers, whose orientation is different from that of medical personnel, emphasize security, swift evacuation of casualties, resumption of traffic flow, and minimizing community disruption. Furthermore, an effort is made to insure that no one else is hurt by falling debris.

Speed is also emphasized when the primary responders are EMTs or ambulance attendants. This philosophy is based on the criteria of efficiency and effectiveness used in "normal" times: a rapid response rate from call to arrival and from arrival on scene to arrival at the hospital. Typically, less than half the casualties are transported from a disaster site by ambulances. Other transportation has been provided by police squadrons, cabs, buses, vans and private cars, all of which act independently of EMTs and often remove casualties before the ambulances arrive.

Another reason for faulty or nonexistent needs assessment is that control and centralization at the site rarely occurs. First, there are explicit competing demands made on the different agencies involved. Each agency seems to have someone in charge who is not recognized as a legitimate authority by the others. Many times a medical doctor may not respond to the orders of an EMT, even though, according to disaster plan, the latter is supposed to take command of the scene. Secondly, the picture is complicated by various agencies arriving at different times. One agency may have the responsibility to assume control but because members arrive late its duties may have been performed by some other agency. When the former arrives an ambivalent control situation exists for it may be unrealistic to change command in the middle of the situation.

One last factor which complicates a proper needs assessment is the lack of integration of the medical component into the community

response. Generally an EMS representative with authority is not present at the site. In some cases a medical team has been in transit to the site and has been refused admittance to the area because it was not seen as legitimate by police or was unknown to the police. In other cases, a medical officer has been designated the authority at the site, but because of late notification and transportation problems this person arrives too late.

Another problem to consider is conflicting tasks. By plan, an EMT may be in charge of medical triage at the site. But assessment on the one hand and treatment, stabilization, and transport on the other are contradictory functions, if carried out by the same person. Thus assessment breaks down.

The final point to be mentioned is that in most cases an EMS representative – administrator or planner at any system level – receives information after the response is over. This means that upper echelon EMS representatives rarely play an active role in the actual delivery of services and more importantly, in the on-site assessment of EMS needs.

CONCLUSIONS AND SUGGESTIONS

This paper has discussed the most important component of the delivery of EMS – a quick and accurate needs assessment. Since most EMS systems have a centralized apparatus for communications, one which is capable of disseminating messages quickly, it is imperative to have an accurate assessment of needs for the system to work efficiently. The deleterious effect of an improper assessment has been demonstrated above. Much of this problem stems from the attempt, as almost all systems do, to use normal everyday techniques in disaster situations – to handle disaster situations as routine. EMS planners and practitioners must ask themselves if this is feasible in mass casualty situations.

The emphasis on speed has been discussed. Some might argue that to stabilize the disaster site consumes valuable time. Yet time can be saved in other areas to compensate for this. To perform needs assessment an EMT must get to the site quickly (many ambulance drivers do not realize how long their initial response time actually is). Getting there more quickly will help, as will shortening the distance to be traveled. Ambulances or ambulance companies can each occupy a primary response zone, thus avoiding the need for a trip across town to make an assessment, when an ambulance was actually located nearer to the site.

Perhaps a mobile communications van, which most state and many large city police have, can be sent to the site in order to improve the quality of messages sent, thereby decreasing the rumors which tend to proliferate. Quite possibly this van can communicate with the hospitals to avoid inequitable distribution of patients. Furthermore, this vehicle could forewarn the hospitals to expect and prepare for a certain type and number of casualties. Although many systems have centralized communication networks, they often break down. On-site communication control could eliminate one link in the normal process of ambulance to control to hospital. Hospitals need direct and accurate information from the scene.

Of major importance to needs assessment and therefore to EMS is the point of entry into the system. More attention must be given to the screening of casualties entering the health care system. Patience and good judgment are essential when making referrals at the site. Since our data indicate that only 15% of ambulance deliveries are emergencies – i.e. are serious enough to be admitted to hospital – efforts should be made to identify and attend to these cases first.

In order to ease the conflict which EMTs experience between the tasks of transportation and assessment, perhaps these tasks could be divided. A first responder team should be designated whose function would be to stabilize and assess only, leaving transporta-

tion and triage to different EMTs and ambulance attendants. Since fire stations are located throughout many cities, the fire department appears to be a logical nominee for first responder. One city in our sample has tried to develop such a system, which does not yet function adequately. Part of the problem in this case may be that a physician is designated as part of the on-site team. Inclusion of a physician, while a fine idea in principle, is often a problem in practice, because physicians are not continuously monitoring community events and may participate only partially or sporadically in emergency communications networks. Thus, they often arrive on the site later than other responders, and can be of only limited assistance.

Unfortunately there have been more questions raised in this paper than answers offered. It is hoped that we have at least drawn attention to a very important but neglected issue in EMS – on-site needs assessment – and that others are stimulated to move beyond this preliminary work.

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RESPONSIBILITY FOR THE DELIVERY OF EMERGENCY MEDICAL SERVICES IN A MASS CASUALTY SITUATION: THE PROBLEM OF OVERLAPPING JURISDICTIONS*

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INTRODUCTION

The delivery of emergency medical services (EMS) to victims of traffic accidents, fires, heart attacks, etc. takes place each day on a routine basis throughout the country. In the vast majority of cases to which an EMS system responds, only one victim, or at most three or four, require treatment simultaneously. There may be busy nights or certain peak hours during which rescue units and ambulances respond to one call after another and hospital staff work continuously, but, for the most part, an EMS system is primarily designed to handle emergencies involving only a handful of victims at any one time.

There are occasions, however, on which an EMS system is called upon to respond to an emergency situation involving a large number of casualties; i.e. 50 or more. Depending upon the nature and extent of the injuries and the availability of resources, a mass casualty situation may temporarily overload an EMS system. Not only are there more victims requiring simultaneous medical attention, there are also more emergency units responding to the situation. The activities of these various agencies and their personnel must be coordinated if the EMS operation is to be carried out smoothly and efficiently.

A number of communities have developed plans for interagency coordination of activities in mass casualty situations. These communities tend to be those in which the potential for various types of mass casualty situations is relatively great. For example, communities in the Midwest tornado belt, the West Coast earthquake belt, and those surrounding major international airports, have developed such plans. However, most of these plans are rather limited in scope, involving the coordination of only two or three emergency agencies, such as police and fire department, or hospital and ambulance company. In addition, the majority of these plans are concerned only with those EMS agencies which normally respond to emergency situations within the political boundaries of a given community.

Mass casualty situations do not always occur conveniently within community boundaries. Occasionally, they may occur at a location which marks the boundary between two communities or between a community and a surrounding unincorporated area of a county or township. When this occurs, several different

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police departments, fire departments, and ambulance companies may respond to the scene, and hospitals in two or more communities may receive patients. Just as there are frequently no plans for extensive interagency coordination at the community level, there are also very few plans for overall coordination at the county or state level in such situations. When a mass casualty incident occurs at a location where the jurisdictions of emergency agencies overlap, coordination of activities more often occurs in an ad hoc fashion, rather than according to some predesigned arrangement.

Since 1975, the Disaster Research Center (DRC) has been engaged in a study of the delivery of EMS to victims of mass casualty incidents throughout the United States. These incidents have included both natural and man-made disasters, such as tornadoes, floods, explosions, and plane crashes. Many of these incidents occurred within the boundaries of a given community; however, some occurred at locations where the jurisdictions of several EMS systems overlapped. The latter cases offer a unique opportunity to examine the ways in which EMS activities are coordinated when multiple emergency agencies respond. In the remainder of the paper we will examine, in some detail, four mass casualty situations which occurred across jurisdictional boundaries and will attempt to determine how coordination of EMS activities was achieved and what problems, if any, were encountered in the process. Finally, we will offer some recommendations concerning how coordination of EMS activities in such situations might be improved in the future.

Before proceeding with the case descriptions, a brief discussion of data collection and analysis is in order. Since its inception in 1963, the Disaster Research Center has employed a qualitative methodological strategy in studying disasters. Such a strategy involves conducting in-depth, semistructured interviews with representatives of the various agencies responding to the disaster, collecting a wide assortment of documents (disaster plans, operations critiques, and agency information brochures), and participant observation of disaster operations. All of the above data collection techniques have been employed during the course of this present EMS study. Most of the information presented in this paper is derived from approximately 40 hours of tape-recorded interviews with representatives of various police departments, fire departments, ambulance companies, and hospitals. Each of the interviews was examined for information pertinent to the coordination of EMS activities, with special attention given to information bearing on direction of rescue and treatment activities at the mass casualty site, control over distribution of patients to area hospitals, and interagency communications.

Having briefly delineated the methods of data collection and analysis used to obtain the information for this paper, we may begin our examination of the four mass casualty situations.

CASE I. PUBLIC TRANSPORTATION MISHAP

This incident occurred on the boundary between a major Northeastern city and a smaller university town. The accident involved a rear-end collision among three rapid transit trains in a tunnel during rush hour. There were no deaths as a result of the accident; however, approximately 130 persons suffered injuries in the mishap and were taken to four hospitals within the city. The most extensive injuries were fractures of the extremities and skull fractures, but most of the injuries were of a minor nature.

A large volume of equipment and manpower responded to the emergency call. Patrol cars from three police departments, two rescue units from the city fire department and a unit from the university town fire department were present at the site. In addition, a total of 19 ambulances representing several public, private, and volunteer ambulance services reported to the scene of the mishap.

Police and fire department personnel were primarily responsible for rescuing the crash victims, many of whom were not seriously injured but required assistance in making their way to the tunnel entrance. Once the victims were removed or assisted from the tunnel, the more seriously injured were placed in ambulances or police squad cars and were taken to the nearest hospital (Hospital A), located several blocks from the crash site. There was little evidence of any effort to triage or treat victims at the scene. City fire department emergency medical technicians (EMT's) did manage to administer first aid to the more seriously injured, but, for the most part, victims were simply transported as soon as they emerged from the tunnel entrance. A large number of the crash victims were ambulatory and, once assisted from the wreckage, made their way to nearby Hospital A.

According to all available accounts, there was no overall coordination of EMS activities at the scene of the incident. Representatives of each of the three police departments present at the scene were unable to provide information concerning which department was responsible for the overall direction of police rescue operations. In addition, there was apparently no one in charge of directing the distribution of victims to the various hospitals in the vicinity.

One result of this lack of coordination was that Hospital A received the majority of the casualties. This overloading of one hospital was due in part to the massive onslaught of ambulatory patients who walked the several blocks to the hospital; however, most of the victims transported by police and ambulance vehicles were also taken to Hospital A. Since the majority of the injuries were minor in nature, the demand placed upon the emergency room was one of volume rather than seriousness. Nevertheless, the very fact that many of the injuries were minor also meant that these victims could easily have been transported to one of the other hospitals in the vicinity.

In addition to the lack of coordination at the crash site, a breakdown occurred in the emergency communications network. According to plan, the city hospitals are to be notified of all mass casualty incidents by means of a central radio network. In this particular incident, the notification system failed to function properly. Hospital A's initial notification of the accident occurred when the first seven patients arrived at the emergency room entrance. Twelve more patients arrived before official notification was received via the central radio network.

Fortunately Hospital A has the staff and equipment to deal with a large volume of emergency cases when the need arises. However, a more effectively coordinated effort at the scene and a more reliable communications network would have allowed the entire operation to flow more smoothly and efficiently.

CASE II. TORNADO

At approximately 5.30 p.m. on a Sunday afternoon, a tornado touched down in a small unincorporated suburb of a major Midwestern city. Roughly 75% of the homes in this suburb were damaged by the storm, 2 persons were killed and 30 others were taken to three area hospitals for treatment. Most of the injuries were minor in nature; lacerations, fractures, and a few head and back injuries. Only eight persons were admitted to a hospital; the remainder were treated and released.

The area in which the tornado occurred is unincorporated, meaning essentially that there is no local police or fire department with undisputed jurisdiction over all emergency situations in the suburb. Ostensibly, the county sheriff's department in normal times has a legal responsibility to protect life and property in the suburb, and the state police are responsible for patrolling the state highways in the area. Fire protection for this area is provided by several nearby fire departments belonging to surrounding small municipalities. There are several hospitals located in surrounding communities but none in the suburb itself. Thus,

the available emergency resources for the community are plentiful, but must be called in from outside the community.

On the night of the tornado, the county sheriff's department, the state police, a unit of forest rangers, and officers from four surrounding local police departments responded to the tornado call sent out over the state-wide police emergency radio network. Fire equipment and ambulances were sent in from two local fire departments and civil defense units from four communities provided assistance in the form of additional manpower for search and rescue operations.

There are several somewhat divergent views concerning the extent of coordination of activities at the scene. According to the representatives of the county sheriff's department, an emergency in an unincorporated area automatically comes under their jurisdiction; hence, they were responsible for directing all police activities at the scene. However, a state police spokesman said that it was the state police who provided overall coordination and direction of activities at the scene. An altogether different view was presented by a regional civil defense coordinator, who felt that there was a total lack of coordination at the disaster site. According to this informant, a multitude of police and fire departments converged on the scene without any clear-cut direction, and although personnel and equipment were plentiful, both were often in the wrong place at the wrong time. In other words, the scene was one of mass confusion. The civil defense coordinator further indicated that one result of the lack of coordination at the site was that five persons were taken to one hospital when they should have been taken to another. In his opinion, without any direct supervision, ambulance drivers were transporting patients to the hospital with which they were most familiar rather than to that hospital closest to the scene or best equipped to handle the patients.

Hospital notification did not appear to be a major problem in this situation. Two of the hospitals were notified via their hospital-ambulance radios that a tornado had touched down in a nearby community. (The third hospital received only one patient by personal request and therefore was not extensively involved in the EMS operation.) However, personnel at the hospital receiving the majority of casualties reported being unable to contact any official at the scene who could provide information concerning numbers of casualties. As a result, the hospital staff prepared for 150 patients and received only 23.

In this situation, as in Case I, there was apparently no overall coordination of EMS activities at the scene. The ranking state police official probably coordinated state police activities, while the ranking sheriff's department official probably coordinated his department's activities. Ambulance personnel apparently transported any victims they were able to locate on their own or to whom they were directed by a police official. Hospitals were notified that a mass casualty incident had occurred, but were left in the dark about the number of casualties involved. As a result, one hospital mobilized more staff and equipment than was needed to handle the emergency.

CASE III. MASS TRAFFIC ACCIDENT

The accident occurred at approximately 11.00 p.m. on an interstate highway near the boundary between a medium-sized Northeastern city and a smaller incorporated town. Slippery road conditions produced a chain reaction pile-up involving a total of approximately 60 vehicles and 120 persons. Most of the injuries resulting from the accident were of a minor nature; i.e. cuts, bruises, and lacerations; however, several of the victims suffered fractures and head injuries, and one victim's leg was amputated. At least 75 persons suffered injuries which were considered serious enough to require some form of hospital treatment. The vast majority of the victims seen by the five hospitals involved were treated and released. Only about a dozen persons were admitted to hospitals.

The various emergency units responding to the scene of the accident included the city police department, the county sheriff's department, the state highway patrol, the city fire department, the privately owned city ambulance company, three volunteer fire departments and three volunteer ambulance companies from the surrounding area. Altogether, several hundred emergency personnel and over 40 emergency vehicles were present at the accident site.

Once again, there is some question as to which agency was in charge of coordinating the overall rescue operations at the site. As previously mentioned, the accident occurred on an interstate highway at the boundary between the city and the small town. From a law enforcement perspective, the state highway patrol is generally considered to have jurisdiction over mishaps occurring on state highways, and, in fact, an on-duty state highway patrolman was involved in the pile-up. However, since the accident occurred at least partially within the city limits, the city police chief defined the situation as one which came under his jurisdiction. According to representatives of most of the EMS agencies contacted, it was the city police chief who formally took charge of the situation. The state highway patrol and sheriff's department personnel present at the scene apparently provided assistance to the city police under the direction of the police chief. According to one informant, however, the county sheriff's department's communications center was responsible for coordinating the activities of the various emergency agencies present at the scene. The sheriff's department has more extensive communications capabilities involving a larger number of city, county, and state agencies than does the city police department. Thus, it would appear that actual coordination of activities at the accident site was under the direction of the city police chief, while the sheriff's department was primarily responsible for relaying messages and alerting various county agencies to respond.

According to a standing agreement between the city police and fire departments, a traffic accident automatically falls under the police department's jurisdiction unless there is a fire at the scene. Since this accident did not result in a fire, although the potential for one was great, the city fire department's responsibilities were limited to aiding in the extrication of victims and being on the alert for the possibility of a fire. The three volunteer fire departments were called to the scene by the county's fire control board following a request for additional manpower and equipment by the sheriff's department. It is not clear who coordinated the activities of the volunteer fire departments or whether their activities were coordinated with those of the city fire department.

While the police and fire departments were primarily responsible for the extrication of trapped victims, ambulance personnel devoted their efforts to victim transportation and the provision of on-site first aid treatment. A division of labor emerged between the city's commercial ambulance company and the county's volunteer ambulance companies. The commercial ambulance company transported approximately 17 victims to hospitals, but once the more seriously injured patients had been removed from the scene, the commercial company's personnel remained at the scene to triage and treat the remaining victims, while the volunteer ambulance companies handled the bulk of the transportation. According to one informant, the personnel of the commercial ambulance company, who are all trained EMT's, were better equipped to handle triage and treatment than the relatively untrained volunteer ambulance personnel.

With respect to the distribution of patients to hospitals, the usual patterns of coordination failed to materialize. Under normal circumstances, the emergency rooms of the five city hospitals receive emergency patients on a rotating basis to prevent overloading any one emergency room. The rotation system, which is controlled by the dispatcher of the commercial ambulance company, broke down on

this occasion, and over half the patients were taken to one hospital. In addition, some of the volunteer ambulance personnel failed to contact the fire control center to report their locations or the nature of the injuries they were transporting. The result of the breakdown in the rotation system was that the hospital receiving the largest number of casualties was in a state of temporary emergency overload for several hours.

In addition to the breakdown in the hospital rotation system, the usual procedure for hospital notification was not strictly followed during this incident. Normal operating procedure calls for the dispatcher of the commercial ambulance company to inform area hospitals of any large-scale emergency. In this case, one of the hospitals was first notified of the accident by the police and only later contacted by the ambulance dispatcher.

Once again, there is little evidence of any general overall coordination of EMS activities at the site of the mass traffic accident or between the site and the receiving hospitals. However, there does appear to have been some degree of coordination among certain clusters of agencies; for example, among the various law enforcement agencies and between the commercial and volunteer ambulance services. What little coordination of activities there was appears to have emerged throughout the course of the incident rather than along the lines of some preestablished plan or design.

CASE IV. CHEMICAL EXPLOSION

This explosion, involving a railroad tank car which contained a highly volatile chemical liquid, occurred at a chemical plant located in a medium-sized Northeastern city. When exposed to air, this liquid is converted into a gas which, if inhaled, produces severe respiratory difficulties. Highly concentrated or prolonged exposure to this gas results in pulmonary edema, congestive heart failure, and death. The explosion occurred on a Sunday evening, when the number of employees present at the plant was at a minimum. However, the chemical vapor cloud produced by the explosion affected persons in an area up to three miles from the explosion site before it dissipated.

Four persons were killed in this incident. Though all four were in close proximity to the tank car at the time of the explosion, they died from gas inhalation rather than from the actual blast itself. The vast majority of the approximately 100 persons who suffered some form of injury as a result of the explosion were taken to two area hospitals where they were treated for gas inhalation. Only 15 persons were injured seriously enough to be admitted to a hospital, while the remainder were treated and released.

This case is different from most in that we are dealing with what might be termed a two-location mass casualty incident. The initial explosion occurred within the city limits and was handled by the city EMS agencies. However, the vapor cloud also produced a large number of casualties in the surrounding county which were handled by the county EMS agencies. Thus, in this case, our primary concern is with the city–county coordination of EMS activities.

Within the city itself, the agencies responding to the explosion included the city police department, the city fire department, and all three of the city's commercial ambulance companies. The city police department was primarily responsible for controlling traffic around the plant area. Unlike in the other three cases presented above, the police department was relatively inactive in rescue operations at the site of the incident. In fact, according to one informant, the city police did not arrive on the scene until one hour after the explosion had occurred. The first agency to respond to the scene was the city fire department. In addition to extinguishing a fire ignited by the explosion, fire department personnel administered oxygen to victims awaiting transportation to the hospital.

Transportation of the injured was handled by the three commercial ambulance companies

in the city which, according to normal operating procedures, receive calls through the city fire department on a rotating basis. In this case, one of these companies did not receive the official call to respond until one hour after the explosion had occurred. However, having heard the initial report of the explosion over the police radio, this company had already dispatched all of its available vehicles to the scene. The three ambulance companies sent a total of seven ambulances to the explosion site. Ambulance personnel established an aid station near one of the plant gates, where, as victims were brought out of the plant, they were given oxygen before being transported to the hospital. According to one informant, cooperation and coordination of activities among the ambulance personnel were extremely good due to pre-existing professional and informal ties among the staff of the three companies. The senior EMT present at the scene was in charge of triage and treatment activities.

All of the victims from the plant itself and those persons in the immediate vicinity of the plant who were overcome by the fumes were taken to the same hospital. This hospital treated a total of 57 persons, 16 of whom were admitted. None of the informants contacted at this hospital was able to provide information concerning how the hospital was notified of the incident. In fact, these informants indicated that the hospital staff was not officially informed of the nature of the incident, nor of the type of gas involved, nor of the number of casualties they might expect to receive. Most of the information the staff did receive came from the victims themselves or through contacts with ambulance personnel during the course of the emergency. The hospital was in a peak emergency situation for approximately three hours.

Twenty minutes after the explosion occurred, the county fire control center received a call for ambulances from a shopping center approximately three miles from the plant. This shopping center was the second site of the mass casualty incident, as persons leaving stores to go to the parking lot were quickly overcome by the gas. Most of the stores in this center were closed; only a food store, a movie theatre, and a bowling alley being open at the time. The county fire control center dispatched rescue trucks and ambulances from four volunteer fire companies to the shopping center and alerted two hospitals in the county, only one of which was actually used.

The county fire control dispatcher was aware of the explosion and the resulting vapor cloud and therefore sent emergency vehicles equipped to handle gas inhalation victims. Victims from the shopping center were taken to a second hospital outside the city, where a total of 38 persons were treated, nine of whom were admitted. The casualties were similar in nature to those within the city, although the respiratory difficulties were generally less severe. While this hospital had been informed by the fire control center that the victims were suffering from gas inhalation, they were not informed of the chemical properties of the gas. Members of the hospital staff recognized the odor of the gas on the victims' clothing, however, and initiated treatment on the basis of their own observations.

Although the EMS agencies in the county were aware of the explosion and emergency situation in the city, the city EMS agencies were generally unaware of the situation in the county. According to one informant, none of the city ambulance personnel had any knowledge of the situation in the county until one of their dispatchers advised them not to take any victims to the county hospital because it was nearly filled to capacity. After the initial emergency period at the plant was over, the seven city ambulances were largely sitting idle at the plant gate for several hours. One informant felt that one or two of the city ambulances could have been sent to the county to provide assistance there after the initial emergency period at the plant was over.

Another informant expressed concern over the lack of ambulance coverage for the re-

mainder of the city during the peak emergency period at the plant. He felt that there was a need for a cooperative agreement between the city and county so that a county ambulance could be moved up to cover the city in the event that all city ambulances were occupied with a mass casualty situation.

In this fourth situation, the lack of a central county-wide communications network and EMS plant meant that the city and county EMS agencies were largely engaged in independent operations when the situation appeared to call for mutual cooperation and assistance. While the county EMS agencies were aware of the problems in the city, representatives of these agencies indicated that they would not respond to a call within the city unless requested to do so. The city EMS agencies, and in particular, the city ambulance companies, would have provided assistance to the county but were largely unaware of the situation.

DISCUSSION

All available information indicates that no serious medical consequences resulted in any of the four situations we have just described. There was no evidence either directly or indirectly suggesting major negative effects on the quality of the medical attention and treatment that almost all disaster victims received. On the other hand, it is not difficult to visualize a variety of complications in medical care and treatment had the nature of the injuries been more serious in all four instances. It is obvious that there was, and probably still is today, considerable potential for various kinds of medical problems in disaster-related EMS in the localities described. In addition, there were unnecessarily strained relations, perceptions that not everyone had acted correctly, and general feelings that something was amiss both within and between various components of the EMS systems involved in all four cases.

Thus, while what occurred in the four specific instances described may not actually have been too bad from a medical viewpoint, the cases can be used to identify those difficulties for which improvements might be instituted. The purpose of this paper has been the identification of existing problems in the delivery of EMS in mass casualty situations occurring across jurisdictional boundaries. In the four cases presented, three analytically separable but empirically interrelated problems stand out as being both recurrent and significant.

Minimal Coordination of On-site EMS Activities

There was no overall coordination of EMS activities at the scene of any of the four incidents. The minimal coordination which did occur tended to develop among certain clusters of agencies, such as between police and fire departments or between commercial and volunteer ambulance services. This limited coordination of efforts generally resulted from previous experience in other situations or emerged spontaneously during the course of the emergency. There was no evidence of on-site coordination following along the lines of any preestablished plan of operations.

Breakdown in the Existing Communications Network

In most cases, the primary on-site EMS response units, police, fire department and ambulance company, were notified of the incident almost immediately and were on the scene within minutes after the initial call. In only one incident, the explosion, did any primary responder report not receiving immediate official notification of the incident. The major problem involving communication was that one of the major components of any EMS system, the hospital, was frequently not informed that a mass casualty incident had occurred. In several instances, the hospital's first notification came when the first patients began arriving for treatment.

Lack of Coordination Between the Mass Casualty Site and the Receiving Hospitals

In those cases in which the receiving hospitals were officially notified that an incident had occurred, they frequently were left in the dark with respect to certain essential information, such as the nature of the incident, the nature of the injuries, and the number of casualties they should expect to receive. Attempts to contact an official at the scene who might have been able to provide the information generally proved to be unsuccessful or pointless, since there was often no one at the scene who possessed such knowledge.

Before offering several general recommendations concerning ways to improve the delivery of EMS in future mass casualty situations, an additional point must be made. The three recurrent major problems discussed above are not restricted to those mass casualty incidents which occur across jurisdictional boundaries. Analyses of numerous other mass casualty incidents, most of which have occurred within a given jurisdiction, indicate that the same problems occur in almost every mass casualty situation. Golec and Gurney (this issue) discuss some of these problems encountered by EMS agencies in 18 mass casualty incidents studied by the Disaster Research Center. Thus, the occurrence of an incident where jurisdictions overlap may merely serve to exacerbate problems which tend to develop no matter where the incident occurs. This indicates that we should focus our attention on improving the coordination of EMS activities generally before we attempt to improve coordination in a multiple agency response situation.

CONCLUSION

There are a number of ways to improve the coordination of EMS activities in a mass casualty situation. First and foremost, there must be some degree of planning for such events – often easier said than done. Planning requires money, time, and concerted efforts on the part of the various EMS agencies in a particular area. Planning should begin at the community level, since the majority of incidents call for a response by EMS agencies located within a particular community. However, since there are occasions on which an incident occurs at a location where community boundaries meet, intercommunity plans or even county-wide plans should also be developed.

EMS plans may vary along a variety of dimensions, but there are several basic elements which should be incorporated into any EMS plan for mass casualty incidents.

Designation of On-site Coordinators of EMS Activities

Decisions must be made about which person or persons will assume responsibility for the overall coordination of on-site EMS activities. In some cases, it may be possible to assign this responsibility to one particular individual who has the position or expertise in the area of EMS to be able to direct rescue, triage, treatment, and transportation activities at the scene. This person might be a police chief, fire chief, or senior EMT of an ambulance company. However, the coordinator should be someone whose authority will be recognized and whose directions will be followed by all EMS personnel responding to the incident. In many cases, one overall coordinator may not be sufficient. This will generally be the case when the incident is diffuse as opposed to focalized and/or when a large number of separate EMS agencies respond to a situation. In such cases, a different coordinator might be designated for each type of agency responding to the situation; that is, a coordinator for all law enforcement personnel, a coordinator for all fire department personnel, and one for all ambulance personnel. If the multiple coordinator option is selected, overall coordination of on-site activities can be accomplished in one of two ways:

(1) Each type of agency can be assigned as specific task area. For example, law enforcement agencies can be assigned to handle traffic control and search and rescue; fire departments can be assigned the task of victim extrication as well as fire control and prevention; and ambulance companies can be assigned the tasks of triage, treatment, and transportation of victims.
(2) The multiple coordinators can establish a central command post so that they can coordinate with each other while directing on-site activities through portable communications equipment.

Establishment of a Central Communications Network and Notification System

In many areas EMS agencies have extremely limited communications capabilities. While most law enforcement agencies have extensive communications networks, most fire departments, ambulance companies, and hospitals are severely limited in their abilities to communicate with other EMS units. Messages must be relayed through several channels, creating confusion, inaccuracy in reporting, and information gaps in the process. There is a desperate need for primary EMS response units to have direct communications links with one another so that each agency may be kept informed of the activities of all other agencies involved in the response.

Even in areas where such a central communications network does exist, special provisions should be made for hospital notification. Many hospitals do not have either the available staff or the desire to constantly monitor a central emergency radio channel. Communications personnel from one of the other EMS agencies can be assigned the task of alerting receiving hospital emergency rooms about the incident by telephone or through a direct line.

Provision for Coordination of Activities Between Site and Receiving Hospitals

By improving coordination of EMS activities at the scene of the incident and by establishing a central communications network and notification procedure, many of the problems involved in site–hospital coordination will be alleviated. More extensive coordination of activities at the scene, especially with respect to the distribution of victims to hospitals will reduce the possibility of any one hospital becoming overloaded with serious casualties. The establishment of a central communications network and notification procedure will alleviate the problem of hospitals suddenly finding themselves in the midst of an emergency situation without prior notification and hence without adequate time to mobilize personnel and equipment. More extensive on-site coordination and better communications capabilities will also facilitate keeping hospitals informed of the nature and number of casualties they will be receiving.

It should be noted at this point that, although EMS planning is important, it is not sufficient in and of itself to insure a coordinated response to a mass casualty situation. Plans must be practiced to be perfected and to familiarize EMS personnel with their respective roles in a given situation. While disaster drills do not possess the urgency of the actual situation, they do provide familiarity with the plan and an excellent opportunity for testing out certain arrangements and for making necessary revisions.

This paper has focused primarily on EMS delivery in mass casualty incidents occurring across jurisdictional boundaries and it is hoped that some of the information provided and recommendations offered may prove useful to EMS agencies and planners at the community level as well as at the county and state levels. EMS delivery is an essential life-preserving task involving a variety of agencies, all of which must work together in order to maintain the provision of high quality emergency medical care to victims of mass casualty incidents throughout the country.

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THE PREVALENCE AND EFFECTIVENESS OF CENTRALIZED MEDICAL RESPONSES TO MASS CASUALTY DISASTERS*

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INTRODUCTION

Centralized coordination of the emergency medical response to disaster situations is commonly advanced as the ideal, but no research has examined the prevalence of such responses or rated the relative effectiveness. This paper reports an exploratory study which allows some initial impressions and tentative conclusions in regard to this issue.

Perhaps Holloway has stated the ideal conceptualization most directly:

> While disaster scene response, transportation, and hospitals comprise the resources needed to get the disaster victim from site of injury to the road to recovery, without an efficient communications and command system to tie these resources together the medical disaster effort will be far from satisfactory (1971).

He further adds that such a system must have "a central coordinating point where information can be received, evaluated, decisions made, and action taken" (Holloway, 1971). A number of others writing on disaster medical services have implicitly or explicitly adopted similar positions (Bouzarth and Mariano, 1968; Murphy, 1972; Sutherland, 1975).

A variety of research, on small groups (Caplow, 1964), organizations (Price, 1968) and disasters (Barton, 1970), indicates that centralized communication and control arrangements are often the most effective way of organizing social units in order to accomplish a task, although specific situations may be handled more effectively with other arrangements. This research was intended, in part, to find out if this is true for medical responses as well.

STUDY DESIGN AND METHODOLOGY

As part of a larger study by the Disaster Research Center at Ohio State University of the delivery of emergency medical services in mass casualty situations, comparative data was available for actual interorganizational responses to ten mass casualty situations which occurred during the one-year period from May 1, 1975 to May 1, 1976. These included four transportation accidents, three tornadoes, two explosions, and one poison gas exposure. These ten cases represent the major such events involving around 50 or more casualties and occurring within the time period.

Ten case studies were constructed from over

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160 tape-recorded interviews with organizational officials, over 110 documents, and over 40 sets of observations and debriefings. This analysis is based upon the classification of response patterns found in the descriptive case studies, and the preparation of quantitative tables showing patterns of association between the occurrence of centralization and the occurrence of various situational characteristics. The final product of the analysis was a causal model which depicts the principal relationships discovered in this exploratory analysis. This model shows the factors influencing whether casualty-handling organizations exhibited centralized or independent patterns of control and communication.

FINDINGS

The principal finding was that centralization is relatively rare. Only one case exhibited full centralization, while two other cases exhibited centralization of subtask areas (such as rescue, transportation, or treatment). None of the others exhibited any centralization, and five out of the remaining seven showed no evidence of direction of any organization by another organization. This analysis will focus upon the situational factors which are associated with centralized responses as opposed to independent ones.

In examining the situational factors which were associated with the occurrence of centralized responses versus totally independent responses, we considered community demography, type and size of the EMS components, magnitude of the EMS disaster, and effectiveness of the EMS response. The following propositions summarize the findings.

1. *As the magnitude of the task increased, a centralized response was less likely.* This can be illustrated by examining Table I. In situations with less than 60 casualties only centralization was found, while in situations with over 120 casualties no centralization was found. Since the number of casualties treated and admitted at hospitals was *not* found to be related to the occurrence of centralization, it seems that the magnitude of the task rather than its specific demands was more important for determining the type of interorganizational response.

TABLE I

Response Table: Total Number of Injuries

	Total Number of Injuries		
	1–60	61–120	Over 120
Response Type			
Independent	0	2	3
Centralized	2	1	0

2. *As the complexity of the resource base decreased, a centralized response was more likely.* The availability of resources can be expected to increase with increasing population. Table II illustrates how centralized responses were more common than independent ones in cities under 100,000 in population. In contrast, no centralized responses were found in cities with populations over 500,000. The larger cities tended to have great amounts of resources dispersed in more complex patterns than was the case for the smaller cities. This complexity seemed to undercut the advantages of numerous resources by making them more difficult to mobilize.

3. *As interorganizational expertise was more available, a centralized response was more likely.* Two rough indicators of interorganizational coordination expertise are the availability of senior organizational officials (typically more

TABLE II

Response Table: Population Size

	Population Size		
	Under 100,000	100,000–500,000	Over 500,000
Response Type			
Independent	2	0	3
Centralized	3	0	0

prevalent during the day than during the evening) and the scope of any interorganizational coordinating centers (more expertise is required if a variety of organizational types are coordinated). As shown in Table III, centralized responses were as likely as not when mass casualty incidents occurred during the day shift, but centralized responses occurred only a minority of the time when disasters occurred during the evening shift. This indicator captures both the availability of personnel resources and also the presence of senior officials and specialized boundary personnel. Table IV shows that the scope of normal interorganizational coordination is a good predicator of centralized disaster response. If normal coordination was limited to one type of organization (ambulances), then a noncentralized response occurred in an overwhelming majority of the cases. If, in contrast, several organizational types were included in normal coordination, a centralized response occurred most of the time. The availability of experienced personnel and the breadth of their experience were thus found to be related to the occurrence of centralized response.

4. *If the resources used were less complex interorganizationally, a centralized response was more likely.* This is most dramatically indicated by the effect of the number of participating ambulance services upon the occurrence of centralized responses. As can be seen in Table V, the use of only one or two ambulance services did not elicit a centralized response in any of the cases looked at. In contrast, the use of five or more ambulance services more often than not resulted in a centralized response. At first glance such a finding appears paradoxical. However, there are two important factors. First, in most cases the number of ambulance vehicles used was roughly the same for similar size disasters regardless of the size of the community. Therefore, major cities comprise those cases involving only one or two ambulance services. However, these ambulance services are very large complex organizations able to handle ordinary emergencies independently. Thus, on a routine basis they did not coordinate their activities with each other or the hospitals to which they were taking patients. Second, although coordination would appear to be harder to achieve when several organizations are involved, this situation tended to be found in the smallest communities. These communities had the fewest resources but were, therefore, more likely to recognize the virtues of cooperation and most likely to have the relationships and past experience to pull it off.

5. *If a response was centralized, it was more likely to be effective.* Two measures of effectiveness were utilized. Both focused upon the experience of the hospital receiving more casualties than any other hospital. The first was a subjective evaluation by hospital staff and personnel in other key organizations of whether or not the hospital received too many casualties for it to cope with in a reasonable

TABLE III

Response Table: Work Shift

	Work Shift	
	Day	Evening
Response Type		
Independent	2	3
Centralized	2	1

TABLE IV

Response Table: Scope of Emergency Medical Coordination

	Scope of Coordination		
	Ambulance	Ambulance & Hospital	Ambulance Hospital Police & Fire
Response Type			
Independent	3	1	1
Centralized	1	0	2

TABLE V

Response Table: Ambulance Services Used

	Number of Ambulance Services Used		
	1–2	3–4	5–6
Response Type			
Independent	3	1	1
Centralized	0	1	2

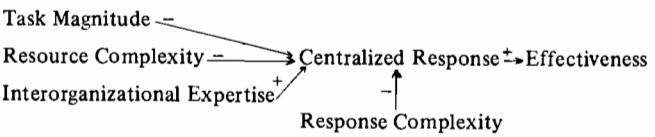
manner (subjective overload). The second was an objective index showing whether this hospital receiving the most casualties also received more than its share of the most serious casualties as measured by admissions (severity allocation). We felt that combining an extraordinary number of patients with a high number of seriously injured ones was likely to hamper provision of the highest quality treatment. Therefore, those attempting coordination would be expected to try to avoid such situations because of their potentially adverse effects. Table VI shows the results for the subjective overload measure. No centralized responses were associated with overloaded hospitals, while noncentralized responses were more likely than not to result in overload. Similarly, Table VII shows the results for the severity allocation measure. No centralized responses result in poor severity allocation, while half the noncentralized responses do. It would seem that centralized responses do yield the results that are claimed for them. A centralized response was always effective by the two measures used here.

TABLE VI

Response Table: Hospital Overload

	Response Type	
	Independent	Centralized
Hospital Overload		
No	2	3
Yes	3	0

The relationships summarized in the previous paragraphs can be used to construct a hypothesized causal model which could be tested in future research.



DISCUSSION

The implications of these findings will be discussed in regard to three issues: the prevalence of centralized responses, the usefulness of centralized responses, and the practical implications of the relative infrequency of centralized responses.

Prevalence of Centralization

Only three out of the ten cases exhibited any type of centralization. This centralization tended to be based upon normally centralized coordination and was found in small communities (under 30,000) which have limited medical resources. The small size of the available cases did not permit controlling for city size so that differential factors between small and large cities could be identified. However, the basic relationship between size of community and type of response is strong enough to conjecture on the factors underlying the relationship. In

TABLE VII

Response Table: Severity Allocation

	Response Type	
	Independent	Centralized
Severity Allocation		
Higher Severity (poor)	2	0
Average or Lower Severity (good)	2	2

general, smaller communities combine both the capability and the need for cooperation across a wide range of activities, since the scarcity of resources is an integral part of everyday life. In contrast, the larger cities have far more available resources on an everyday basis than they are likely to need. Often, these resources are concentrated in a few massive organizations in any particular sector. The relative self-sufficiency of such superorganizations in everyday emergencies makes it difficult for them to cooperate if the need ever arises, because they do not do so on an everyday basis. A mass casualty situation typically involves more casualties than a single ambulance service or hospital can handle on a routine basis. Extraordinary efforts are required, and the response is considerably facilitated if other organizations help. In smaller cities, such cooperation is readily available if it is needed, but in larger cities it is not there whether it is required or not. The result is that centralized responses do not occur.

Usefulness of Centralization

The least surprising result of the study was the general effectiveness of centralized responses. Perhaps the only surprise was that no ineffective centralized responses were found. It is likely, however, that such cases will be found when larger numbers of cases are examined. As was previously indicated, the other disaster, small group, and organizational literature had suggested that centralization was usually but not always the most effective way of coordination.

Implications

Perhaps the major implication is that one should not be pessimistic about the lack of centralized responses. True, there is relatively little that can be done in most places about such a lack of coordination, because various situational factors on an everyday basis determine the occurrence of centralization. However, one can take comfort in three things. First, large-scale mass casualty disasters are relatively rare in American society. Approximately ten or fifteen cases with over forty injuries in a one-year period in the entire U.S. is a very small number. Therefore, planning for events of such magnitude does not make much sense on a cost-effectiveness basis for most communities. However, cities in more disaster-vulnerable areas probably require some degree of prior planning, since disasters causing a dozen or more casualties are not uncommon and frequently require the mobilization of additional resources. This is especially true for the largest cities, since heavy concentrations of people increase both the probability of occurrence of and the number of injuries from transportation accidents and other technological disasters. For most cities, though, the planning effort would be better invested in upgrading the everyday operational EMS setup to a centralized operation with procedures extendable to the larger casualty situations. Although political and economic factors often make total centralization unfeasible, even limited progress in this direction can dramatically improve both daily and disaster EMS results.

Second, the types of places which exhibit centralization are the ones which need it most often. The small resource communities recognize their interdependence and manage to achieve centralized responses. The largest communities have sufficient resources, and they seldom need to coordinate their activities. However, other compelling arguments, as noted above, could be made for investing in planning in these largest cities.

Third, noncentralized responses are just about as likely to be effective as not. This means that the odds are still pretty good that things will come out all right anyhow. In fact, although the effectiveness ratings were poor for a number of situations and indicated that the conditions were ripe for difficulties, a majority of these responses fortunately did not encounter any serious problems.

CONCLUSION

This exploratory study examined the occurrence of centralized responses to mass casualty situations and their relative effectiveness. Centralized responses occurred a minority of the time but were effective when they did occur. These centralized responses tended to occur in smaller communities (with limited resources) and in which such cooperation would be necessary. The largest cities (with vast resources) tended to cooperate badly, and centralized responses were nonexistent. In consequence, responses were less effective.

The relative rarity of mass casualty disasters makes planning for them largely unprofitable for most communities, and efforts would likely be better expended towards a centralized normal EMS operation which could be utilized in mass casualty situations. For the most part, the type of response seems to be appropriate to the size of the community in which it occurs. Small communities recognize their interdependence, and their natural cooperation often leads to centralization. Larger communities have sufficient resources concentrated in a few large organizations and seldom is there any need for interorganizational coordination. Finally, noncentralized responses in these rare events are as likely to be effective as not. Therefore, a majority of the responses to these events were effective regardless of prior planning and training.

In conclusion, it is hoped that this limited and exploratory study has shown the value of further research into the nature and prevalence of mass casualty situations. The results are tentative but they show the existence and consequences of a general lack of preparation for mass casualty situations in most communities. At the same time they show the effectiveness of centralized responses, and the importance of normal centralization is enhanced when one realizes the degree to which it facilitates the handling of mass casualty situations. Finally, the relative lack of research on disaster medical situations makes studies like this imperative, so that planners and operational personnel can have a firmer basis for making the crucial decisions they are faced with every day.

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DISASTERS AND EMERGENCY MEDICAL CARE: METHODS, THEORIES AND A RESEARCH AGENDA*

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INTRODUCTION

The quest for relevance has at last reached disaster research and, with its promise of Faustian compacts, threatens to overwhelm the scholarly attraction of examining a phenomenon for its own sake. There appears, for example, to be a pernicious but nevertheless widespread notion about that the behavior of emergency medical services (EMS) during disasters represents a valuable set of educative insights and evaluative indicators as to how EMS behave routinely in non-disaster situations. The argument has at first glance a spurious air of intuitive reasonableness: since medical care demands generated by a disaster are a qualitatively identical but quantitatively more intense version of routine demand for emergency medical care, the disaster response of hospitals, ambulances and public safety agencies may be taken as a useful, generalizable and valid test of their likely non-disaster response. From this basic tenet flow several secondary but prevalent myths:

– modifying an EMS system to create a more effective disaster response will necessarily and unaided also result in a more effective non-disaster response;

– disaster responses are sufficient tests of routine EMS so that day-to-day monitoring is unnecessary;

– inter- and intra-organizational relationships involving the evacuation and referral of patients, the dispatch of ambulances and general resource allocation are identical in disaster and non-disaster situations to the extent that either is predictive of the other and an organizational commitment to a specific policy change for a disaster may be taken to infer willingness to behave similarly in routine daily EMS operations.

One of the excellent contributions of the papers from the Disaster Research Center (DRC) at the Ohio State University in this issue is to carefully document and disabuse us all of the notion that the disaster response of EMS is identical or even similar to routine EMS behavior. Tierney and Taylor state:

> ... it is commonly argued by EMS professionals on all levels that everyday and disaster EMS are simply two points on the same continuum. DRC research indicates that this is not the case. Mass emergencies create demands that differ qualitatively and quantitatively, from everyday EMS demands (this issue, p. 153).

As examples are cited the convergence of press, relatives and medical personnel on hospitals in disasters and the greater importance attached

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to speed and less to overall coordination in routine EMS as compared with disaster EMS. Worth and Stroup comment that "... [although] disasters are often regarded as an extension of day-to-day EMS as a more-of-everything situation, [in fact].... disasters present circumstances which are different in more complex ways than sheer numbers of casualties" (1977: p. 168). Two important factors might be added to this list. First, the program guidelines of the Department of Health, Education and Welfare's (DHEW) Division of Emergency Medical Services explicitly state that the local EMS system is not the disaster organization. Thus, the Division requires that:

> The EMS system must have a plan to assure that the system will be capable of providing emergency medical services in the system's service area during mass casualties, national disasters or national emergencies. The EMS system is not the regional health disaster organization. It is the emergency medical organization that will work with other agencies during a disaster to provide emergency medical care. The EMS system must be linked to the local, regional and state disaster plans and participate in exercises to test disaster plans (DHEW, 1973).

As further evidence of the distinction that DHEW sees between routine EMS and disaster response as well as depressingly, of the mundane quality of Federal thought on disaster evaluation, the following criteria are those used by DHEW in assessing the adequacy of the disaster planning component of an EMS system application for Federal funds. (This component, incidentally and tellingly, receives a magnificent weight of only 100 points out of a maximum of 3000 used to prioritize an entire application.)

> 1. Does the application contain provisions for EMS during a disaster?
> 2. Does a plan exist for systematic delivery of EMS during either a natural or man-made disaster?
> 3. Is the disaster plan an appropriate modification of the EMS system's daily operational procedure?
> 4. Is there assurance that adequate non-telephonic communications will be provided?
> 5. What provision has been made for distribution of the disaster instruction manual to all system elements with periodic drills and adequate evaluation?
> 6. What assurance is there that revision will be accomplished immediately after test or drill evaluations?
> 7. Will disaster plans be tested once during the grant period?" (DHEW, 1973).

The second differentiating factor between disaster EMS and routine EMS has to do with defining the optimal inter-hospital distribution of patients. In most EMS systems, the routine day-to-day major problem is that patients are distributed between too many hospitals regardless of their varying capacities to render quality care while the idealized solution is seen as a regionalizing strategy of concentrating patients at a very few hospitals. In direct contrast, the problem of disaster EMS is that patients are distributed amongst too few hospitals and that the solution to be aimed at should be a more pluralistic evacuation protocol.

This last point serves to emphasize that the notion of identity between disaster EMS and routine EMS is not only a falacious belief but one that could, and perhaps already does, prove dangerous if widely believed and acted on. Thus, many EMS systems have given themselves a false sense of security as to their routine EMS capability, solely on the basis of one or two superficially effective disaster drills. Often systems harbor under an entirely inaccurate set of self-comforting beliefs as to county/city or even fire/police department routine EMS cooperation on the fragile basis of inter-agency and inter-jurisdictional agreement to a disaster plan.

In this light, then, the realization that disaster EMS response has little to tell us about routine EMS response ought not to be a depressing conclusion that belittles the significance of disaster research. Indeed, the realization can be a constructive and enlightening one for both disaster EMS and routine EMS since it removes the limitations of cross-relevance and inter-generalizability. In going their separate ways, newly liberated from each other, each may be pursued for its own sake and for what each tells us about itself. The papers in this volume are a significant step in validating

disaster EMS as a scholarly area of conceptual and programmatic significance, and in delineating the remaining tasks to be resolved before this body of knowledge can continue its substantial forward progress. The rest of this paper will be concerned with these tasks which may be listed as follows:

1. What are the most appropriate methodologies to collect data on disaster EMS?
2. What are the most insightful theories and concepts to be used in organizing data on disaster EMS?
3. What should be the research agenda for disaster EMS in the coming years?

METHODS FOR DISASTER EMS

The central methodologic problem in collecting data on the operation of EMS during disasters is quite obvious: since disasters have an irritating tendency toward unpredictability as to time and place of occurrence, it is unlikely that skilled observers (for whom detached observation is their sole function) will be present during the disaster. For the most part, then, the data are collected retrospectively from a number of sources and are inherently subject to the limitation of all retrospective as opposed to prospective data obtained from subjective as opposed to objective sources. The Disaster Research Center has, of course, been long aware of this problem and has attempted to deal with it. Neff describes the DRC data collection techniques:

> Since its inception in 1963, the Disaster Research Center has employed a qualitative methodological strategy in studying disasters. Such a strategy involves conducting in-depth, semi-structured interviews with representatives of the various agencies responding to the disaster, collecting a wide assortment of documents (disaster plans, operational critiques, and agency information brochures), and participant observation of disaster operations. All of the above data collection techniques have been employed during the course of this present EMS study. Most of the information presented in this paper is derived from approximately 40 hours of tape-recorded interviews with representatives of various police departments, fire departments, ambulance companies, and hospitals. Each of the interviews were examined for information pertinent to.... (this issue, p. 180).

In another paper, Tierney and Taylor indicate the kinds of multiple casualty and disaster situations in which data were collected:

> ... DRC has conducted field studies of 27 mass emergencies in 22 communities, spanning 14 states, the District of Columbia, and the U.S. Virgin Islands and gathered baseline data in a number of other U.S. cities. Field research has consisted of three kinds of studies: baseline or Time One studies used to gain information on EMS disaster planning and normal EMS operations in six disaster-prone U.S. communities; on-the-spot research of five pre-planned events, such as the Mardi Gras in New Orleans and the July 4 Bicentennial celebration in Washington, D.C. and Philadelphia, Pa., where the possibility of excessive casualties was anticipated; and studies of Time Two operations, or the EMS response in 22 mass casualty events... Disaster agents included four tornadoes, two floods, eight transportation accidents, one major fire, and seven explosions and toxic leaks. Often, more than one trip was made to a community by DRC personnel, so that knowledge could be gained concerning EMS operations in pre-, trans-, and post-disaster settings (this issue, p. 151).

In the same paper, Tierney and Taylor also outline the three key characteristics of the DRC research strategy:

> First, a large number of cases, exhibiting a variety of system characteristics were needed... Second, field teams had to be present on the scene as soon as possible... Third, in order to understand system organization and functioning, it was necessary to have contact with key EMS officials and operational personnel in a variety of emergency health care organizations... Observational data, obtained on-site by field personnel, was invaluable as a source of information about the reliability and validity of data obtained by other means as well as information about the reality as opposed to the ideal of EMS delivery in high demand situations (this issue, p. 152).

Against this background of existing DRC methodology in the EMS study, it is necessary to be concerned with the validity of the data thus collected, not so much because DRC methods are deficient but because validity is of primary importance in any newly emergent

area of scholarship.*

VALIDITY OF THE DATA

Are the data being collected an indicative measure of disaster response? The dependent variable of the disaster response of EMS is generally defined in these papers as the presence of such imputed properties as "coordination", "centralization", "effectiveness", forewarning of hospitals, etc. Many of the papers (the most impressive exception being the contribution of Wright) define EMS disaster response in slightly differing ways and several fail to offer a definition, in the sense of a measurable indicator, at all. In a quite extraordinary finding that would have made a less courageous or committed investigator substantially less enamoured of the validity or even importance of their explanatory variables Neff states:

> All available information indicates that no serious medical consequences resulted in any of the four situations we have just described. There is no evidence either directly or indirectly suggesting major negative effects on the quality of the medical attention and treatment that almost all disaster victims receive (this issue, p. 186).

Presumably if a set of descriptive parameters are important enough to be pursued as defining effectiveness of a disaster EMS response, they should not only be theoretically important but also substantively important in being related to vital consequences of an EMS response such as the quality or outcome of medical care rendered. And yet all that Neff's barrel-scraping search can come up with as being related to ineffective responses (defined this time as overlapping jurisdictions) is the ease of visualizing "a variety of complications in medical care and treatment had the nature of the injuries been more serious..." and "... unnecessary strained relations, perceptions that not everyone had acted correctly, and general overall feelings that something was amiss..." (this issue, p. 186).

These varying definitions of the dependent variable of effectiveness of disaster EMS response and the general absence of evidence linking ineffectiveness to such substantively important adverse outcomes as mortality and morbidity suggest prima facie problems of validity. In defining effectiveness of health services, the investigator is faced with three choices: of selecting normative standards that refer to input (the availability of resources), process (the utilization of resources) or outcome (change in health status of the patient target group) criteria (Gibson, 1977). In general, health services research over the last decade has focused more and more on outcome definitions of effectiveness as conceptually and programmatically most important and de-emphasized input and process measures as often bearing an unsubstantiated relationship to outcome. Faced with this, it is difficult to accept both conceptualization and definition of effective disaster EMS response contained in these DRC papers as self-validating and correct merely because it is stated, particularly when the various authors seem to be saying something different in each paper.

There are, of course, several types of validity and of procedures to validate measures, all of which require a degree of independent confirmation explicitly absent from most of the DRC papers. As I have indicated elsewhere:

> Reliability testing tells us only whether measures allegedly indicative of a concept... can be repeated by different observers at different times. Validation testing refers to whether the items did indeed indicate the underlying concept or variable allegedly being measured. Validity is assessed by seeing whether the scale relates closely to other measures commonly accepted as indicative of the same variable, whether the items are compatible with previous conceptualizations in the literature, and whether

*It had been my intention to discuss the reliability of the DRC data at least as reported in the five DRC research papers in this volume. However, since I understand this methodological issue is addressed in other DRC writings elsewhere, I forego any detailed discussion of the matter. However, some recommendations relevant to the reliability of data which might be gathered in any future study of the delivery of EMS in disasters are set forth in my first three recommendations at the end of the article.

the scale predicts (both prospectively and retrospectively) the outcome variables accepted as alternative indicators of the concept being measured (Gibson, 1976).

Wright's is the only paper making a serious attempt at face validation of his concepts/measures of EMS response effectiveness by deductively deriving them from the theoretical models of others. Formal procedures do exist and could be modified for research use. A starting point would be to take those communities exhibiting disaster responses generally regarded by programmatic experts as effective and compare them with communities with disaster responses regarded as ineffective to identify those characteristics which differentiate the two sets of communities. These characteristics would then be submitted to an expert panel so that these characteristics can be screened to eliminate conceptually unreasonable indicators and to differentially weight the remaining items according to whether their presence denotes effectiveness or ineffectiveness. This is, of course, the procedures one goes through in constructing and testing a scale and, in fact, it is impossible to conceive of a more important or immediate methodologic task facing disaster research than establishing by these means a scale of EMS disaster response effectiveness. With such a scale, a remaining and more important convergent validation could be attempted by determining the correlation with other alternative measures of effective response. Although there may be alternative measures other than adverse medical outcomes, it is hard to accept the conceptual and programmatic credibility of a measure that bears no relationship to outcome. The past decade of health services research is littered with the reputations of investigators who believed falsely that effectiveness could be measured without reference to outcome and solely in terms of compliance with theoretical esoterica of the investigator's own formulation without any objective validation. Disaster research has an opportunity to avoid such errors in judgement and should seize it.

Until these validating procedures have been undertaken, disaster researchers ought not to pursue the tautalogic naïveté that ineffective disaster response is denoted only by an absence of coordination and centralization and that such an absence can be assumed rather than shown to be associated with actual adverse consequences. Organizational analysis achieved its eminence by showing that organizational properties were related to and causal of substantively real and important consequences rather than merely of other organizational characteristics. It continues, I suspect, to be a fragile and conditional matter. The ultimate validation is, of course, the ability to accurately predict the nature of an EMS disaster response prospectively and to do so in a variety of settings. Such an activity is infinitely more impressive than the Monday-morning quarterbacking we all engage in by claiming to predict something that has already happened. Despite the nature of disasters, they are sufficiently frequent in occurrence unfortunately, to allow the testing of predictions and DRC could well be spending some time in courageously giving "hostages to fortune" by publishing predictions about the nature of EMS disaster responses in identified communities. If Jeanne Dixon can do as much, ought scholarly data to be as far behind? Until this happens, it will always be difficult to tell whether the data being collected are valid indicators of EMS disaster response rather than some other overlapping, parallel or even independent construct.

THEORIES FOR DISASTER EMS

The major distinguishing characteristic between generalizable higher-order propositions that allow us to predict the unknown future from the known past on the one hand and pedestrian or parochial case-by-case description on the other is the former's firm anchorage in theory or at least within an explicit conceptual framework. Such a framework sensitizes

the investigator to certain concepts, processes and variables and blocks out others and should, therefore, be chosen explicitly and voluntarily rather than assumed by default. Tierney and Taylor identify DRC's theoretical focus as follows:

> DRC researchers focused upon EMS as an open system response. According to this view, all organizations involved in the various phases of patient care in disasters are seen as interfacing and acting in a more or less integrated fashion to deliver services. System imagery was used in this research for several reasons. First, this parallels the approach used by DRC in the study of other aspects of community disaster response for example, the reaction of the group of organizations collectively termed the "political system". Thus, the EMS system was viewed in this research as one of a set of community systems which could become active in the pre-, trans-, and post-disaster settings. Another advantage of the adoption of the concept of system is that its use requires that attention be paid to the environment or context in which a group of organizations operates. EMS delivery in mass emergencies is seen as being affected by both internal system factors and factors external to the system, including other community systems. Finally, the concept "system" was employed because of its wide currency in the health care disciplines. Indeed, system imagery is becoming increasingly common in many areas of scientific study, from biological science to social science (this issue, p. 151).

It seems that in fact there is much less to this passage than meets the eye. Despite a claim of a theoretic focus, the Tierney and Taylor paper and others (again with the exception of Wright) have a distinctive atheoretical appearance. Instead of a theory being used to derive hypotheses deductively which may then be said to test that theory, the few hypotheses in evidence seem to be inductive and intellectually parentless. Concepts scamper after measures throughout the five research articles in this issue but never quite catch up, while measures abound with no explicit conceptual basis.

A fully elaborated theory with interlocking propositions that explain the phenomenon at hand is expecting too much. There is, I suspect, a middle position between that and the present papers and it would consist of a theoretical typology that describes systematically and theoretically the observed responses. If police/fire departments or state/county/city jurisdictions cannot be related to some conceptually important differences then they ought probably not to be mentioned in the first place. Without a theoretic anchorage, such descriptions are best left by scholars to reporters who do it rather better and less self-consciously. Even when the open systems approach has been used in the DRC papers it has not been used enough or with sufficient discrimination. Open systems theory does not merely posit that organizations "interface" but specifies the alternate processes of instrumental vs. expressive functioning or vertical vs. horizontal integration and delineates such key and relevant properties as homeostasis, adaptation, boundary maintenance, tension reduction, etc. These concepts and processes are not only deductively important components of open systems theory but offer the prospect of inductive insights in describing and explaining disaster EMS responses. Similarly, the "concept of system" does not merely "require that attention be paid to the environment or context..." but delineates the procedures whereby matter-energy is brought from the environment through ingesters and input transducers across boundaries into systems, as I have attempted to show in "The Social System of Emergency Medical Care" (Gibson, 1973).

All of this is not to say that open systems theory is the only conceptual perspective or even the best, although DRC papers as if it were one or the other and probably the former. Indeed, the DRC papers at least as represented in this volume, give no indication of having reviewed available theories and chosen knowingly or even willingly among them. The point has already been made that systems theory assumes relative consensus and perhaps even creates it when it is not really there and that it does not sufficiently sensitize researchers to conflicting interests between agencies and facilities nor to the at least conceivable chance

that an effective disaster response could come from pluralism rather than centralism and from dissensus rather than consensus. It is important therefore that disaster researchers be more self-conscious in their choice of theoretic frameworks and more aware of the insights and constraints inherent in each. Thus, conflict theory or at least exchange theory would, in my judgement, be more attuned to the competition between institutions for resources and mandates and to the adaptive readjustments each makes to the other. More specifically, social science has done remarkably well in explaining the relationship between interacting roles in institutions by means of role theory, and the set of concepts generated by this perspective offers much in achieving an appropriate balance between insights and constraints. Similarly, signal detection theory and value added models are likely to be of assistance in deriving concepts and in integrating findings within a more abstract and, therefore, more generalizable formulation.

Indeed, this two-way function of theoretical framework deserves particular emphasis in disaster research. The pressure for relevance and programmatic advice to EMS systems and disaster agencies is building up almost insurmountable pressures against theoretic formulation. Thus, many EMS disaster studies are entirely atheoretical in the mistaken belief that theory prevents rather than enhances practice while most studies use theory either to formulate the problem or to express the solution but not to do both simultaneously. The case needs to be made soon and more convincingly than in the past that atheoretical data dredging is not only bad scholarship but bad program assistance to disaster agencies. The best way to make that case is, of course, to show how a theoretical framework can be used:

(1) to systematize existing substantive literature so that knowledge can be accumulative and educative as to needed future studies,

(2) to derive concepts of important theoretic insight as components of a systematic descriptive typology,

(3) to deduce hypotheses of relationship between concepts in a way that is both measurable with operational indicators and a logical test of the framework from which they are derived,

(4) to modify the original framework to take into account the proven and disproven hypotheses from the study setting,

(5) to suggest future settings, and elucidating hypotheses for future research, and

(6) to develop a propositional inventory and therefore an explanatory model that is internally consistent, parsimonious, and even elegant in explaining much behavior in many settings, from relatively few variables or processes.

This requires substantial changes in the way we conduct studies in disaster research. We should subscribe to the self-denying ordinance that a disaster response will not be studied merely because it happened and is available. A disaster response should be examined only if the setting, for which hypotheses have already been derived, is theoretically important. In part, this requires less opportunism than at present and a more explicit sampling strategy than is apparent to date. Thus, a framework will delineate parameters thought to be influential in determining disaster EMS response (centralization, frequent disaster drills) and an a priori sampling matrix should be developed to specify strata or quotas or settings which systematically vary the properties under examination. And for each type of setting (centralized, frequent drills vs. centralized infrequent drills) hypotheses should have been developed. And if a disaster occurs in a setting that is not part of an a priori nominated quota of interest, disaster researchers ought to have the theoretical self-discipline to leave that disaster alone. Even greater professional self-discipline will be required in collecting only data necessary as indicators of a significant concept and not data dredging for its own

sake. We really ought to start making a distinction between data and mountains and realize that it is only the latter that are pursued merely because they are there and available. I rather suspect that explanatory models would be better developed even with less data from fewer disasters than at present if investigators had been and were more selective in their data collection strategies and better anchored in conceptually based measures. It is a peculiar irony that such a selective focus is well-nigh impossible with open-ended interviews, random probes and multiple interviewers. It also should be added, even at the risk of institutional bankruptcy for several of us, that a variable does not automatically become conceptually significant merely because a disaster agency or, heaven forbid, a research funding agency identifies it as of interest.

SUMMARY AND CONCLUSIONS: A RESEARCH AGENDA FOR EMS AND DISASTERS

The realization that the response of EMS in disaster situations may significantly vary from the EMS response in routine non-disaster situations, it has been argued, should be seen as a liberating opportunity that allows disaster research to be pursued with undiluted and single-minded scholarship. This opportunity also brings with it a challenging obligation to develop and apply appropriate methods and theories, and the DRC papers in this issue have been used as the basis for a critical and hopefully constructive assessment. It should be emphasized that the DRC papers have been used for this purpose not so much because they typify deficiencies but rather because they represent the best available. Under the general rubric of methods and theories the following developmental activities have been identified as needed and they might reasonably be regarded as a research agenda.

(1) much greater and explicit concern should be paid to data reliability both in verifying information secured on interview and in presenting sufficient evidence in published versions so that other investigators can independently assess the evidence and the reasonableness of the conclusions drawn from it. In addition, explicit and formal decision rules must be developed a priori as to what shall constitute evidence and corroboration of it.

(2) the rate and types of conflicting testimony are likely to be of methodologic and substantive significance and should be pursued systematically within the context of stratification theory and the sociology of knowledge. Disaster researchers have an obligation to identify in advance which positions will need to be interviewed in order to secure a comprehensive, verified picture of disaster events and to indicate and justify the actual response rate secured. Interviews should be conducted at varying levels of an agency hierarchy and a series of hypotheses tested on between-vs. within-agency differences in perceptions.

(3) Systematic comparisons should be undertaken as to the effect of the data collection method upon the findings and the extent to which closed vs. open-ended interviews with or without random probes and other sensitizing and/or reinforcing interviewer feedback significantly influences the amount, nature and accuracy of data secured.

(4) As a matter of high and immediate priority, developmental effort should be invested in constructing and validating a scale of effectiveness of disaster EMS response. In addition, data validating investigations should be mounted to independently validate through panels and other means the face-, criteria-, convergent-, and predictive validity of relevant data items and measures. Different measures of response effectiveness should be developed and compared for feasibility, construct validity, and ease of measurement. In addition, disaster researchers concerned with EMS would prob-

ably benefit from much greater clinical advice and awareness which would and needs to serve as an antidote to the present rather naive and utopian optimism about the unbounded efficacy of medical care in disasters.

(5) A variety of theories, models and conceptual frameworks should be identified and assessed for their utility in EMS disaster research. Hypotheses should be deductively derived in a way that allows a test of a theory and projectively published for later testing when data becomes available. Retrospective hypothesis testing ought to receive lower priority as should data collection of items lacking conceptual significance.

(6) Disaster research ought to exercise more self-restraint in developing typologies from existing data and reanalyzing past disaster information to develop, test and interrelate inventories of propositions rather than observing disasters not likely to involve theoretically significant settings or conceptually based items. Collecting less but more significant data on fewer but better selected disasters offers the prospect of greater scholarly gain than the present somewhat random walks.

The acceptance of these research tasks and their adequate funding is an issue of substantial importance in view of the theoretic and programmatic significance of EMS and disaster behavior. Too much is at stake for it to be further delayed; too little has been accomplished to date for the matter to be regarded as even half resolved.

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FINANCIAL IMPLICATIONS OF NATURAL DISASTERS: SOME PRELIMINARY INDICATIONS

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INTRODUCTION

The financial impact of natural disasters on society has increased substantially in recent years. The havoc wrought by Tropical Storm Agnes in June, 1972 in the eastern United States, where damage to personal and business assets was a staggering $ 2 billion, illustrates the problems faced by households and firms in their recovery efforts. As discussed in several sources (Kunreuther, 1973; Rawls and Stranahan, 1974) very few of the victims were covered by insurance so that most of them turned to the federal government for relief. The response was, as usually occurs when a response is made without prior planning, somewhat uncoordinated. For example, changes in the Small Business Administration (SBA) program were rushed through the United States Congress with little concern as to the long-run effects of these changes. Likewise, the state of Pennsylvania immediately instituted a grant program for flood victims. Some of these benefits were later taxed by the United States Internal Revenue Service. Furthermore, after a substantial number of homeowners had utilized their own resources and/or incurred additional debt in order to recover from Agnes, the Urban Renewal program began to purchase unrepaired homes at preflood market values substantially reducing the impact of the disaster on those homeowners while breeding resentment among those that had begun the recovery effort on their own. Such results suggest that research into the financial effects of disasters and the associated recovery period might be appropriate.

Previous Studies

The impact of mass emergencies on communities has been the subject of some analysis by disaster researchers. For example, Prince (1920) analyzed the long-run changes in Halifax, Canada, caused by a catastrophic explosion in that community. Studies on Hurricanes Audrey and Carla, and other American disasters in the 1950s to the mid-1960s also focused on organizational preparation in the community (see, for example, Bates et al., 1963; Moore et al., 1964; Taylor et al., 1970; Rosow, 1977). The role of the 1964 Alaskan earthquake in changing the sociological, organizational and economic characteristics of a community has been studied in detail and reported by the National Academy of Sciences (NAS) (1970). Similarly, much of the work at the Disaster Research Center of the Ohio State University centers on the roles of various community groups in disaster preparedness as well as the response of various organizations during the postdisaster and recovery periods (see Quarantelli and Dynes, 1970; Quarantelli, 1977). These studies suggest that disasters

might provide the stimulus for change which may otherwise take an exceptionally long time to accomplish.

While these and other studies examine disaster preparedness and the recovery process, many of the studies do not fully consider the economic consequences of the disaster. That does not mean that economics has been totally ignored. The NAS study of the Alaskan earthquake has reports by Rogers, Kunreuther and others on the economic impact of that disaster. Furthermore, work by Haas and Kates (1973) as well as current work by the Social and Demographic Research Institute (SDRI) of the University of Massachusetts under Rossi, by a group at Northwestern University under Friesma, and by other groups concerns the economic impact of some past disasters such as the Topeka tornadoes, the Yuba City floods, and the Seattle earthquake. These studies analyze the economic effects for an entire region with respect to employment, income, production, and other macroeconomic variables. The economic impact on a particular element of the community such as the household, has remained largely untreated, however. An exception is the study by Dacy and Kunreuther (1969) who looked into the economic implications of federal policies, prevalent in 1969, toward disaster victims, focusing primarily on households. Since that time, several changes in the disaster recovery programs have been made which are discussed by Kunreuther (1973). While these studies by Kunreuther as well as one by Cochrane (1975) consider the impact of various types of economic aid to victims such as insurance and SBA loans, detailed analyses of the impact on household financial characteristics are not available. The need for further studies in this area was underscored in a recent assessment of research needs by White and Haas (1975). Some recent work by Kunreuther et al. (1976) has begun the analysis of the economic impact on the household.

Yet for any victim of a disaster, this area is of prime concern. Of course, the financial characteristics of households have been studied outside of a disaster context. Some data collection and analysis has been completed on the financial characteristics of households (see, for example Projector, 1968; Projector and Weiss, 1966; Friend and Blume, 1976; Dunkelberg and Stafford, 1971; and others). All of these deal with financial decision making under normal conditions. They enable one to study what types of funds a household utilizes for purchasing specific items. A disaster, however, is by definition a violent change from normal conditions (Barton, 1970). In that situation households have to acquire a substantial number of items at approximately the same time, generally in excess of the available resources.

As a result, several plans have been devised by the United States federal government to aid the financial recovery of the households. There have been no studies undertaken to determine whether these plans have provided the necessary funds needed by households, to what extent they are used, and what their effects have been.

Hence, a study is needed to examine the impact of disasters on the households and the postdisaster financial recovery path. The purpose of this paper is to present preliminary findings on these questions. A survey of a sample of disaster victims is described in the next section; a preliminary analysis of the survey data follows. The final section presents conclusions and recommendations.

FIELD SURVEY ACTIVITIES

To determine the financial impact of a disaster, it was necessary to obtain information on the values of the various asset and liability accounts from the victims of a disaster. Projector (1968) and Projector and Weiss (1966) showed it was possible to obtain this information from individuals by interviewing households in a nationwide survey. Although they demonstrated the feasibility of such a survey, specific data on changes in financial position caused by a disaster are not available.

Sample Selection

To obtain this information, households in a community which suffered a disaster had to be interviewed. Such a community is the Wilkes-Barre/Wyoming Valley area of Northeastern Pennsylvania, the heart of which is Luzerne County. In June, 1972, the area was devastated by flooding of the Susquehanna River caused by Tropical Storm Agnes (for different accounts of the disaster see Mussari, 1974; Blanshan, 1975; Cohen, 1976; Heffron, 1977). It appeared that such a community would be useful for obtaining the information needed to study the financial impact of at least natural disasters [1].

Using census tract information and an outline of the flood area obtained from the Luzerne County Planning Commission, the population of flood victims was identified. Based on the 1970 census information, this area included 23,455 households. These households were grouped by census tracts and a random selection of these tracts was made by household density. The tracts chosen as part of the sample were then completely enumerated. The final sample was then chosen randomly from the enumeration. This procedure insured obtaining a random sample such that the results of the sample would closely approximate that of the population.

Questionnaire Construction

Before constructing a questionnaire, it was necessary to determine how the information would be organized so as to assure that relevant data were obtained. While a uniform format has not been developed for households, a systematic way to present financial information has been developed by constructing balance sheets similar to those utilized for the analysis of business firms [2].

During the spring of 1974 a questionnaire was constructed after referring to other questionnaires used for financial and disaster research such as the Projector and Weiss (1966) and Kunreuther et al. (1976) studies. The preliminary questionnaire was tested by face-to-face interviews of households in Wilkes-Barre to determine any problems with responses or any information omitted. Based on these interviews the final form of the questionnaire was developed which was again pretested to assure its completeness.

The final version of the questionnaire was designed to provide the following information:

a A section concerning the impact of the disaster on employment. While not directly used in the construction of financial statements, it does provide information on changes in the employment patterns of the victims and the amount of time needed for the household to regain its income from employment.

b A section describing housing, autos, and personal possessions in physical and financial terms; that is, in terms of physical characteristics as well as cost and market values. The data obtained for these items are before the flood, immediately after the flood, and two years later.

c A series of questions on housing before the flood and the financing of that housing. Housing patterns after the flood are studied as well as questions on current housing. In-depth questioning concerning the role of the SBA and bankruptcy in the recovery process is also included.

d These sections are then followed by questions concerning the status of various asset and liability accounts. Again the information obtained is prior to the flood, after the flood and two years later. The balance sheet for each household is developed from this section.

e Finally, a series of questions on the demographic and socioeconomic characteristics of the respondents is asked.

The survey was conducted in July and August, 1974, by face-to-face interviews with respondents.

Survey Response Experience

The response experience of the survey is summarized in Table I. Several features of the response pattern should be noted. It was the objective of this survey to interview the residents of the chosen household who had been living there in June, 1972. With respect to renters, this proved quite difficult. First, the owner of the property had to be determined from tax assessment records. After contacting the owner for the name of the tenant(s) who

resided at the property at the time of the flood telephone, state grant, Red Cross, Housing and Urban Development or other records were searched to find the present whereabouts of these renters. While considerable success was achieved, the location of 3% of these renters could not be determined. Neither former friends, landlords, nor neighbors knew where they were. They had not applied for any type of disaster relief either. Based on the sample population, more than seven hundred households just disappeared without a trace. While most of these victims probably just moved away, it is a surprising result. While it was beyond the scope of this study, it might be interesting to follow the migration patterns of these victims.

Another aspect of the response pattern involves those who were known to have left the area. Most were homeowners who had their homes acquired by the Luzerne County Redevelopment Authority in conjunction with Urban Renewal. These homeowners took the proceeds and moved at least fifty miles from the Wilkes-Barre/Wyoming Valley area. This being the case, the results obtained here are biased toward those who remained in the vicinity of the Wilkes-Barre area.

TABLE I

Characteristics of non-respondents

	Total	Percent of total sample
Total sample	200	100
Unable to locate	6	3.0
Moved from area*	10	5.0
Deceased	4	2.0
Vacant at time of flood	6	3.0
Incorrectly included in flood map	6	3.0
Not at home	78	39.0
Completed interviews	90	45.0

* More than fifty miles from the Wilkes-Barre/Wyoming Valley area.

Finally, there was a large proportion of "not at home". Since the interviews were conducted at a time when people tended to go on vacation or be involved with activities away from home, a much higher level of "not at home" was encountered than might be expected.

It should be emphasized that the nonrespondents tended to be scattered throughout the sample. There is little reason, therefore, to believe that any relevant bias has been introduced into the sample by nonrespondents.

The reliability and validity of the information provided by the respondents is of obvious concern. Several methods are available to check the reliability of survey data. Projector and Weiss (1966), for example, used independent sources for verification such as banks, brokers, etc. Such a process was far beyond the resources available for our study.

Another possibility is to reinterview respondents and check the similarity of the information provided both times. Such an exercise was also beyond the scope of the project here. Most respondents referred to documents containing the necessary information, however. It can be presumed, therefore, that measurement error is not excessively large which will tend to minimize the biases in subsequent analyses. Hence the data can be presumed to be reliable in general. Exceptions to this situation are noted where pertinent.

PRELIMINARY ANALYSES OF QUESTIONNAIRE DATA

While in-depth analysis of the survey data has not been completed, some preliminary results of the survey appear quite interesting.

Impact on Employment

The interesting result which comes from this section of the survey was that the flood did not have a large impact on employment because over one-quarter of the population was already unemployed before the flood. This high rate of unemployment was due to the high percentage of retirees in the popula-

tion (20%+) which is much higher than for the U.S. as a whole (retirees are classified here as being unemployed) and is also reflected in the above-average age of the community. Of those working, most described themselves as blue-collar or lower white-collar workers. Of these, a very high percentage (80%+) reported some damage to their work place from the flood. Those which reported flood damage to place of employment stated that two months was the median time of unemployment due to the flood. Significantly, less than 5% of the population had to change jobs due to the effects of the flood.

While the impact on employment here appeared in line with the results previously suggested by Cochrane (1975) and Haas and Kates (1973), it does suggest that the recovery process of the business community tends to be faster than for households. This is to be expected as the emphasis is generally on rehabilitating the businesses first so that the households can reestablish their flow of income.

Asset Losses Experienced by the Community

The survey then examined the effects of the flood on such physical assets as homes, personal possesions and automobiles. Information on such financial assets as savings was also gathered. Several startling results were obtained which are now reviewed.

Assuming that the sample reviewed here is representative of the population of the devastated area, it appears that damages for the area are grossly underestimated. Damages to structures and contents were reported in the local newspapers as approximately $445 million for households in the Wilkes-Barre/Wyoming Valley area. It is not known how these estimates were derived but, using the data from the survey, it is estimated that the area suffered damages to *households alone* in excess of $646 million or *$200 million* more than estimated. Excluding public and business losses as well as psychological and sociological losses, the magnitude of these damages ranks this event as one of the major disasters to hit an American community.

Impact on Real Assets

The impact on house values was considerable but apparently most owners had rebuilt two years later. Over 67% reported that their residence was heavily damaged. This result is borne out by reviewing the decline in house values due to the flood. Prior to the flood the average value of a home was $21,000, while immediately after the flood the average value had declined to $8,200 or an average loss of $12,800 (each of these accounts is on the balance sheets shown in Table II). This loss is not necessarily the repair cost but may also include the unattractiveness of the area immediately after the flood. No attempt was made to determine if factors other than damages reduced market value. It is interesting to note that two years later the average value of a house had not only returned to preflood level but at $27,000 was in fact higher. These results suggest that the victims had completed the recovery process and had returned to preflood conditions. In fact, 70% said their present housing (two years after the flood) was the same or better than their preflood housing. Such a conclusion would be hasty, however. Not only did 30% say their housing was worse than preflood but also it will be seen later that some fundamental changes in the financial condition of these households had taken place which were a function of the recovery process.

A more vivid picture of the flood's impact is seen when reviewing the changes experienced in home furnishings. Prior to the flood, the market value of the home furnishings in the average house was $ 10,100. After the flood, these furnishings were valued at an average of $900. Two years later, the household furnishings were valued at more than $11,200. Similarly, personal property (such as silver,

TABLE II

Comparative Household Balance Sheets for the Average Household

	Prior to flood	After flood before recovery	Two years later
Assets			
Cash & demand deposits	$ 1,850	$ 1,850	$ 1,850
Securities	3,650	3,650	3,275
Savings accounts	5,300	5,300	5,500
Savings bonds	1,225	1,225	1,435
Cash value of life insurance	2,800	2,800	4,000
Financial assets:	$ 14,825	$ 14,825	$ 16,060
Automobiles	1,900	1,600	2,200
Market value of home	21,000	8,200	27,000
Market value of contents	12,500	1,100	12,300
Real Assets:	$ 35,400	$ 10,900	$ 41,500
Total Assets:	$ 50,225	$ 25,725	$ 57,560
Liabilities			
Notes payable	$ 330	$ 330	$ 490
Unsecured credit	70	70	115
Current Liabilities:	$ 400	$ 400	$ 605
Bank Loans	600	600	550
Mortgages	3,600	3,600	1,100
SBA loans	0	0	12,700
Other loans	115	115	190
Long term debt:	$ 4,315	$ 4,315	$ 14,540
Net worth: (equity)	$ 45,510	$ 21,010	$ 42,415
Total liabilities & net worth:	$ 50,225	$ 25,725	$ 57,560

furs, paintings, etc.) was valued at $2,400 prior to the flood while after the flood it was valued at about $200. Two years later, some recovery is noted to $1,100 but it is still less than half of the preflood value. Again, such results suggest that, except for some personal property items, the victims had fully recovered from the disaster.

These results also demonstrate that the usual assumption made by casualty insurance companies that the value of home contents is half that of the structure grossly understates the actual values. The average home value of $21,000 previously shown consists of both land and structure value. The survey ascertained that the average land value prior to the flood was $4,500, leaving $16,500 for the structure. Taking half of the structure value for contents value, as casualty companies do, suggests a contents value of $8,250. Furthermore, casualty companies include all personal property in this value while the survey value only included home furnishings and not personal property such as furs, silver, paintings, etc. Including personal property as well as home furnishings results in a preflood contents value of $12,500. However, the values used here are all *market* values which are less than the *repla-*

cement costs used by the casualty insurance companies. If it is assumed that market value is 80% of replacement cost, the preflood replacement cost of the contents is $15,625 or 95% of the structure value [3]. Besides suggesting that most households are underinsured, probably quite accurately, these results suggest that disaster aid programs which might be designed using casualty company assumptions will probably be inadequate [4].

The final physical asset account investigated involves automobiles. Prior to the flood, the market value of automobiles for the average household was slightly more than $1,900 while after the flood it was slightly more than $1,600. The $300 difference suggests that while some households suffered damages to automobiles, most autos escaped damage. It is interesting to note that two years later the value had increased to $2,200. Several reasons can be suggested for this phenomenon. It is possible that those who lost their automobiles in the flood replaced them with cars whose market value is greater than the preflood auto value either because the car is newer or is a more expensive model than the one lost. However, it may also be due to victims buying new cars even though they had not suffered damage to their automobiles. Preliminary analysis of the survey data shows that while only 20% of the households reported damage to automobiles, 52% purchased at least one new car after the flood. Although an examination of such social behavior is beyond the scope of this study, it might be a fruitful area for research to study why people were buying new cars while claiming to have insufficient funds for recovery.

Impact on Financial Assets

Now that the influence on physical assets has been examined, the impact on financial assets (such as savings, securities, etc.) can be reviewed. One characteristic of financial assets is that they cannot be destroyed by a disaster [5]. Thus, the value of these accounts after the flood but before the recovery is the same as before the flood. Since these assets are easily converted to cash, they are available to meet recovery expenses. The question of interest is to what extent these financial assets change over the recovery period.

Prior to the flood, the average household had $1,850 in cash and demand deposits. Two years after the flood, it was still $1,850. Likewise, the average household had $3,650 in marketable securities (stocks, bonds – except U.S. Savings Bonds –, etc.) while after the flood it was $3,275, a net decrease. Since the stock market was somewhat lower in 1974 than in 1972, the decrease in value does not necessarily mean disposal of any securities but may merely reflect a reduction in their value.

Savings must also be reviewed. Prior to the flood the average household had $5,300 in savings accounts while two years later it was $5,500. In a similar fashion, such a household owned $1,225 in savings bonds while two years years later it owned $ 1,435. These results show that there was no decline in the level of these assets and, in fact, there may have even been a slight increase.

Finally, life insurance is an asset which is convertible to cash. Prior to the flood the average family had $2,800 in cash value while two years later that amount had risen to $4,000. The reason for the increase is that disaster victims increased life insurance purchases after the disaster.

It can thus be seen that if the assets prior to the flood were totaled, the average household would have owned $50,225 in financial and physical assets (see Table II). After the disaster, these assets had declined to $25,725 or *a loss of $24,500 per household.* Two years later, however, the value had increased to $ 57,560. As previously stated, such observations have led to suggestions that the recovery process was virtually complete and that households had returned to their preflood status. However, there are two sides to the balance sheet. The impact of the disaster on liabilities must now be reviewed.

Impact on Liabilities

Liabilities are divided in a manner similar to assets; those which mature very shortly (generally within one year) and those of longer length. Two types of liabilities are classified as current – unpaid credit purchases such as credit cards etc., and notes payable such as finance company loans. Prior to the flood the average household had $70 in unpaid credit purchases and $330 in notes due. Two years later, they had increased to $115 and $490 respectively. Thus, the short-term claims on the household had increased over the recovery period. There are several possible reasons for these increases. Funds which were used for the payment of bills before the flood may now be used for recovery expenses. For example, if households borrowed money from whatever source to repair damage, those loans must be repaid regularly out of current income. These payments reduce the amount available for other living expenses which means the amount of purchases made using credit must be increased; e.g., after the flood, the doctor may have to wait two months to get his bill paid instead of one month as before the flood. Another reason might be that some home furnishings were purchased using credit either before the SBA funds were released or because SBA funds had been depleted. While there is no way to know exactly what brought about these increases (and in fact it may be all, some, or none of the reasons given here) what is important is to note that such increases do occur.

Somewhat different results are seen when reviewing certain long-term debts. Prior to the flood, the average household had $115 in non-bank loans and $600 in bank loans. Two years later these had changed to $190 and $550 respectively. Such changes are by no means spectacular and do not necessarily indicate any fundamental changes.

The most startling results come when reviewing mortgages where real estate is the collateral. Prior to the flood, the average household had $3,600 in mortgage debt. Two years later, this had changed to $1,100. Much of the reduction can be traced to the debt repayment feature of the SBA loan program [6]. However, prior to the flood no one had an SBA loan whereas two years later the average family had $12,700 in SBA debt (not including the $5,000 foregiveness grant feature). The $5,000 grant (less taxes on that amount) was available to the household for any recovery purpose and was not to be repaid. Since there was no liability on the part of the household, assets were increased by $5,000 (less taxes) with no corresponding increase in debt. Since total assets must equal total liabilities plus equity, the net worth component increased by that amount and can be viewed as a return by the government of some equity lost in the flood. Notwithstanding this return of equity, there is a significant increase in the amount of long-term indebtedness of the household.

Analysis of the Preflood Ratios of the Household

Now that the components of the balance sheet have been examined, it is necessary to see how the financial characteristics have changed from the time before the flood to the time two years later. Adding up the components of the liability side prior to the flood, the average household had approximately $4,715 in total debt. If total assets before the flood were $50,225 this household had a net worth (equity) of $ 45,510. Dealing in absolutes often leads to meaningless comparisons and erroneous conclusions, however, in that households with the same assets may have financed those assets quite differently. Ratios may provide a better comparison. For example, if the total asset of each household is divided by that household's total assets, the relative claims on assets by others could be compared across households. Likewise, ratios can be used to highlight changes in a household's balance sheet between two points in time (e.g., pre-

disaster vs. post-recovery). Ratios can be constructed to examine liquidity (financial assets in relation to total assets or to debts), claims (debt) on what the household owns (assets), and others. Constructing certain standard ratios shows that claims on assets by others (ratio of debt to total assets) was 9.5% and the ratio of debt to equity was 0.10 (see Table III for a summary of these ratios). The current ratio was 3.1 and the quick ratio was 2.4. These ratios mean that the average household could meet its total debts from financial assets (it had more than three times as much in financial assets than debts or more than twice as much in financial assets, excluding marketable securities, as needed to pay off all debts) and would not have to sell a home or other real asset to meet these debts. Finally, the average household preferred to keep 29.5% of total assets as financial assets. To determine whether these were unusual, one would have to compare these ratios with ratios developed for similar households [7]. These preflood ratios appear to be typical of a community with a high proportion of older households and households with a high variability of income. As stated previously, this was predominantly a blue-collar/lower white-collar community which typically suffers a high variability in income from frequent layoffs. Further, it is shown later that this is indeed a much older community than the average U.S. population (the median age is fifty years)[8]. It is therefore assumed that these ratios are an adequate representation of the preflood levels of debt and financial assets of the community. For the purposes of this study, it is also assumed that these ratios indicate the preferred levels of debt and financial assets and the levels which the average household strove to attain after the flood.

TABLE III

Summary of Household Financial Ratios

Series	Before flood	After flood	Two years later
Current ratio*	3.1	3.1	1.06
Quick ratio**	2.4	2.4	0.84
Debt/Total assets	0.095	0.183	0.26
Debt/Equity	0.10	0.22	0.36
Financial assets/Total assets	0.295	0.576	0.279

* Defined as financial assets/liabilities.

** Defined as financial assets less marketable securities/liabilities.

Analysis of the Postflood Ratios of the Household

It is assumed that immediately following the flood, debts did not change but only total assets. At that time, net worth (equity) had declined to $ 21,010 resulting in a debt to equity ratio of 0.22 and a debt constituting 18.3% of total assets, i.e. a sudden doubling of these quantities. While the current and quick ratios had not changed, the financial assets were then 57.6% of total assets due to the loss of real assets.

As previously discussed, it is shown that two years later the level of assets for this average household had not only returned to preflood level but in fact was higher. Debt, on the other hand, had also increased. Total debt for this household was then approximately $15,145. Net worth (equity) was then $ 42,415 or somewhat less than before the flood. This equity, however, had to support debt levels much higher than before. After two years the debt to equity ratio was 0.36 and the debt *26% of total assets.* Not only were these levels very much higher than desired by the households (as compared to preflood levels) but, in fact, were even higher than the households experienced *after* the disaster but before recovery. Likewise, the current ratio had declined to 1.06 and the quick ratio had declined to 0.84. The average household would be able to pay its debts only by depleting its financial assets including securities even if at a loss from cost. There was no cushion for any unforeseen emer-

gencies or illnesses. Compared to the preflood level, the average household had substantially more debt and a smaller cushion of financial assets than before the flood.

Finally, the ratio of financial assets to total assets was 0.279. The decline in this ratio from its preflood level means that the level of financial assets was lower than what the household had felt was prudent before the flood even though the actual levels of these assets had increased from that prior to the flood. As a result, it is unlikely that the victims will further use financial assets for recovery.

Thus, the recovery process may have permitted the restoration of assets but has done so only by forcing the households to accept a greatly deteriorated financial condition. These results explain why individuals who had apparently been restored to preflood condition complained bitterly that they were actually in much worse condition due to their now being saddled with an SBA loan.

Role of Life Insurance

It is important to note that in the event of the death of the head of the household the estate would have the proceeds of an insurance policy but, of course, would not be able to use the cash value of insurance nor have to pay back any loans secured by the policy. To examine this aspect, the face value of life insurance policies was determined before the flood and two years later. The average household had life insurance worth $9,012 after deducting loans on the policy. The current ratio before the flood after deducting the cash value of insurance from financial assets was 4.57 and the quick ratio was 3.78. Two years after the flood the postrecovery value of the insurance had increased to $9,832 as previously suggested by the increase in cash value. At the same time the postrecovery current ratio had decreased to 1.45 and the quick ratio to 1.23. While debts could still be paid in the event of death, there was little provision for other unforeseen events such as a long costly illness before death or some other type of financial emergency. Furthermore, if the average household could barely repay its debts, it can be assumed that a large portion of the population would have insufficient financial resources to repay debts.

Implications for Policy

These results have several implications for the scope and direction of disaster recovery policies. First, it is necessary to be aware that replacement of destroyed assets does not mean that the household has returned to its preflood status. The method of financing the acquisition of these assets must not seriously differ from that which the household felt prudent to follow before the flood and must not seriously alter the claims by outsiders on those assets. For example, if an SBA-type loan program is used, it might be able to provide some type of debt insurance as is done with loans from government chartered credit unions.

Consideration should also be given to variable socioeconomic characteristics when designing recovery programs. While it is not being suggested that older and/or less affluent victims should be completely subsidized, these groups are the least able to withstand the financial impact of a natural disaster. Some attention should be given to their situation when recovery proposals are developed.

Other Results from the Survey

The change in the financial characteristics found in the survey is a function of the socioeconomic characteristics of the population under study. These are now reviewed.

Questions concerning income, age, marital status, etc. were asked. The average income prior to the flood was $9,200 while two years after the flood it had increased slightly to

$9,550. These results are in line with the rule of thumb used by bankers that house value should not exceed two and one-half times annual income (in fact, in this case, it is 2.3 times). This income level places this average household in the lower middle class which corresponds to the finding that of the working respondents 90% had blue-collar or lower white-collar occupations. Over 20% of the respondents were retired, however.

Besides having a lower income level, the residents in the Wilkes-Barre/Wyoming Valley area tend to be older (median age is fifty years), Catholic (65% of the population), and have a median education level of tenth grade. While most were married (over 70%), a surprising number were widowed (16%). These characteristics suggest that the particular population studied here was the least able to withstand the changes in financial position occasioned by the flood.

Several other items were also examined which are now enumerated. One area of interest involves the role of warnings prior to the flood. Only 60% said they heard any warnings and for those that did, the median time was six hours before the flood waters hit. It is also interesting to note that of those who heard the warnings only *one-third* said they believed them. As a result most did nothing, but those who did, attempted to move furniture and other belongings. Of those who did move items, median savings of $1,200 were obtained. While the savings were small compared to the losses experienced, it demonstrates that adequate warnings, convincingly conveyed, can lead to some savings of property.

Several other financial aspects of the recovery process were also examined. Less than 10% received financial aid for housing and those that did received an average of less than $150, primarily from the Housing and Urban Development agency. An area of concern was the role of urban renewal. Ten percent of the homes were acquired by the Luzerne County Redevelopment Authority under the Urban Renewal program. Another 10% of the homeowners said their houses had not been acquired but they wished they had been, primarily because preflood value was paid for acquired homes. In fact, it is probable that an even higher percentage would hold this view today. The role of Urban Renewal in the recovery process is one which deserves more study.

Several other programs also met with varying degrees of success. Less than 40% of the respondents utilized a "mini-repair" program which provided some minor repairs with an average value of $ 1,000. The food stamp program was better utilized with more than 85% using food stamps for two months on average.

Besides the questions on assets and liabilities several areas concerning financial decision making were also explored. The first involves the early repayment of the SBA loan. Although very favorable terms were available (thirty-year loans at 1% interest rates when market rates were 8 to 10%), a study of other disasters by Faier (1975) suggests that individuals would retire this debt faster than usual. In this survey, of those who took out an SBA loan, more than 30% said they plan to pay off the loan faster. The usual reason given supports the contention that individuals dislike debt because of its claim on assets as well as the aspects of fixed payments.

Another area of interest concerned the declaration of bankruptcy. One way to discharge excessive debts is to declare bankruptcy. While not condoning the abrogation of responsibilities, we included a question about bankruptcy as it was of interest. None of the respondents declared bankruptcy and less than 8% even considered it. The usual reason given for not doing so was that it was immoral. Thus, as there is a strong societal stigma attached to the declaration of bankruptcy it appears to be unimportant in the financial recovery from natural disaster.

It is also of interest to see to what extent other sources of funds for recovery were utilized. For example, only 6% of the respondents received financial aid from the Red Cross. For those who did, the average amount was fifty dollars. Likewise, more than 30% did not obtain any funds from the state government although it was readily available. Those who did, received an average of $1,650 [9].

Finally, the casualty loss provision of the Federal Tax Code allows the claiming of losses from natural disasters as a deduction on income taxes. Although 98% said they had suffered damage from the flood, only 52% filed a claim for a casualty loss. Furthermore, while the average loss was $ 24,500, the average casualty loss claim of those who did file a claim was $ 10,200. Thus, nearly half of the victims did not utilize the casualty loss provisions and those who did, did not take the maximum advantage of this source of funds. Since 25% of the respondents were retired or unemployed, it is likely that they do not pay taxes and could not use this provision. Neither this survey nor the Projector and Weiss (1966) study obtained information on taxes paid but it can be assumed that unemployed or retired households had insufficient taxable income to have a tax liability. However, there appears to be a significant number of households which apparently could have benefitted but did not avail themselves of the opportunity. It can only be surmised that they were unaware of the opportunities available. The fact that the average claim was less than the average loss suggests that victims were unwilling to fully exploit the tax laws for one reason or another. In any case, they offer an underutilized source of relief funds and may represent a possible reduction in the cost of recovery to the government through the use of existing programs. This aspect of the recovery process should be studied further.

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The survey described here has studied the impact of a natural disaster (Tropical Storm Agnes, June, 1972) on a particular community (Wilkes-Barre/Wyoming Valley). While limited in scope the survey uncovers some problems that the current recovery mechanisms create in their impact on the financial conditions of households. It is shown that not only did the financial wealth of the individual household decline due to the disaster but that the mechanisms for recovery further aggravated the situation. It is suggested that the methods to effect recovery from natural disasters need in-depth analyses to determine the financial implications.

It must be emphasized that the analyses done here concentrated on the "average" household. While such an approach is interesting it is also necessary to look at the variations among different age and income groups. Likewise, the impact on other financial characteristics is also important. This article was concerned with the impact of the disaster on the balance sheet accounts, but the impact on income and expenses is also very important. The results presented here suggest that such analyses are needed to determine the total financial impact of natural disasters as well the associated recovery mechanisms. This study does provide a framework for analysis which can be utilized in future research.

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NOTES

1 Further discussion is confined to *natural* disasters. There might be differences in other types of disasters.
2 Interested readers may obtain a copy of a report detailing the methodology used in determining the financial characteristics of households from the author.
3 Assuming a market value equal to 80% of replacement cost is equivalent to assuming an average age of approximately six to ten years, not an unrealistic assumption.
4 The current SBA program has maximum levels for each category and does not have any relationship between structure and contents losses.
5 An exception to this generalization is when a financial asset is secured by a physical asset which is destroyed in the disaster. For example, if a household held a mortgage on another piece of property which was destroyed by the flood, the value of that mortgage would be reduced. Since few households lend to others by writing a mortgage, such exceptions are relatively unimportant.
6 See Kunreuther (1973) for a discussion of this feature.
7 Such comparisons are now in progress utilizing the Projector-Weiss (1966) data but they are beyond the scope of this paper.
8 It should be noted that these ratios support the findings of Projector-Weiss (1966). They suggest that older households not only have lower debt ratios but also tend to have far more financial assets (higher current and quick ratios) than other age levels.
9 The survey took place during the distribution of the second half of the state grant. Thus, most respondents had received only half of what they ultimately received.

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DISASTER IN HISTORY*

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Introduction

History written under the aspect of catastrophe would surely have a distorted appearance: a tale told in terms of floods, plagues, and earthquakes. Historians have instead chosen to ignore disaster except at those points (e.g., the Black Death) where its inclusion is unavoidable. But if for a moment we examine the interplay of disaster and history, their conjunction can be viewed from two perspectives: we might examine the consequences of disasters, as William Langer prodded his fellow historians to do (Langer, 1958). That would involve distinctions between short-term and long-term effects, variations in the capacity for adaptation and rehabilitation, and the degree to which catastrophes retard or accelerate changes already in progress. The other perspective assumes that disaster itself has a history, that the phenomenon of sudden collective unmanageable stress has its own vicissitudes. This second perspective is adopted here. The history *of* disaster contains two aspects, the objective and the symbolic. Thus to the outside observer the objective characteristics of catastrophe may appear to change over time, revealing shifts in causation or level of damage. The symbolic aspect deals with the manner in which collective stress is perceived and conceptualized by those who have felt it or who may undergo it. As we shall see, disaster studies have neglected the symbolic aspect, concentrating upon descriptions of events rather than upon their perceived significance. The symbolic aspect must be taken into account, for often a "disaster" is any event which individuals so categorize, irrespective of causation or level of damage. Further, we shall find the occasional paradox that the stress events which symbolize disaster at a particular time may be quite different from the stress events which an outside observer notes as most common or most destructive.

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THREE DISASTER MODALITIES

In a recent typology of crises, Jean Lipman-Blumen (1975) identifies several dimensions of crisis situations. Six are especially helpful in suggesting variations in the historical patterns of catastrophe: pervasiveness versus boundedness; transitoriness versus chronicity (i.e. short- v. long-term); randomness versus expectability; natural causes versus artificial causes; perceived solvability versus perceived insolvability; and substantive content (whether political, economic, social, etc). Changes along these dimensions have produced a sequence of three disaster modalities between c. 1750 and the present. These modalities I call the *homeostatic*, *metastatic*, and *hyperstatic*. They result from changes in predictability, source of stress, and perceptions of solvability. They can be distinguished from one another by their temporal and spatial boundaries and their sub-

stantive content. The three modalities may be briefly summarized as follows:

(1) *Homeostatic disaster*: natural catastrophe which reflects the rhythms and limits of nature, and assumes return to equilibrium;

(2) *Metastatic disaster*: artificial catastrophe caused by human behavior and whose unclear spatial and temporal boundaries make return to equilibrium problematic;

(3) *Hyperstatic disaster*: artificial catastrophe intensified to the point of completely obliterating discernible spatial and temporal boundaries, through global extension and system-destroying properties.

The first category includes virtually all natural disasters. The second includes explosions, local economic fluctuations, and most conventional warfare. The third includes world depression, nuclear war, genocide, and large-scale ecological imbalance.

Homeostatic natural disasters were the principal form before c. 1750. One must tread carefully here. Fire was feared and frequent in the wooden buildings of pre-industrial cities. The ferocity of the Thirty Years' War suggests the rising potentiality of humanly caused destruction. However, qualitatively new forms of mass misfortune were introduced after c. 1750: the sudden destruction of pre-industrial status hierarchies, business panics and depressions, mass migration into overcrowded cities, deteriorating conditions of employment, colonial expansion, and modern warfare. Most were connected with that complex of technological and socio-economic innovations usually referred to as the Industrial Revolution.

The same technological developments that created new metastatic forms of disaster also made the older, homeostatic forms appear controllable in principle if not always in fact. The declining significance of natural disaster and the rising importance of artificial disaster continued through the nineteenth and into the twentieth century. About 1930, however, the intensity of metastatic disaster underwent a quantum leap from which hyperstatic forms began to emerge. Hyperstatic forms exhibited a scale that eclipsed their predecessors: mass terror, genocide, nuclear weapons, world depression, and ecological imbalances. Ironically, science and technology reduced the fear of natural hazards at the same time that national governments mobilized science and technology to make the hyperstatic forms possible.

The caveat must be entered here; no modality ever possessed monopoly status, nor did any mode abruptly appear or disappear at a fixed point in time. Rather, before about 1750, the vast majority of disasters were of the homeostatic type, with a residual number of metastatic forms, primarily associated with extremes in warfare and interethnic hostility. By the second half of the eighteenth century, the perceived salience of homeostatic disasters had begun to fall rapidly. Their place was taken by the metastatic upheavals of the industrial age. This decline in the role of natural catastrophes continued into the twentieth century, but at a decelerating rate as the perceived salience of natural hazards lessened. Natural homeostatic disasters now constitute a residual category, just as metastatic disaster did two and a half centuries earlier.

In the early twentieth century, one detects the first premonitory signs of modern hyperstatic catastrophe: e.g. the uncontrolled slaughter during certain battles in World War I and the contemporaneous genocide of Armenians in the Ottoman Empire. This sliver widened rapidly in the 1930s and succeeding decades, with the Great Depression, the Soviet Purge of 1936–1938, the Nazi genocide program, and the utilization of nuclear weapons. These are the "extreme situations," the "megadeaths," that distinguish the imagination of disaster in the mid-twentieth century (Lifton, 1967; Shneidman, 1974, pp. 179–198). Metastatic catastrophe, to be sure, continues to exist in such familiar guises as local economic fluctuations and industrial explosions. But at a

perceptual level they have given way before a concern for the possibility of mass destruction on a total, global level.

Natural disasters may be termed homeostatic, because they exhibit the periodicities of the natural world.

> Despite the impression of our senses that the natural environment is always changing, there is nevertheless an underlying pattern of magnitudes and frequencies . . . that can be measured and estimated within a certain margin of error . . . nature remains fairly constant over decades and even centuries . . . The same cannot be said of human activities (Hewitt and Burton, 1971, pp. 76–77).

Homeostatic disasters are part of a fixed repertoire of natural hazards. Human innovation, on the other hand, opens the prospect of constantly changing metastatic and hyperstatic disasters. The fecundity of culture can cause the repertoire of disaster forms to undergo sudden, unforeseeable expansion: hazards not yet conceived may preoccupy the minds of a future generation. When the capacity to create disaster is placed in human hands, one consequence is a significant loss of predictability. Fixed parameters confine natural hazards within fairly inflexible spatial and temporal borders. While a margin of error always remains, the geographical extent and the duration of natural hazards do not allow indefinite expansion. In this sense, too, metastatic and hyperstatic disasters are departures, for they render once inflexible boundaries increasingly elastic.

"DISASTER" AS A MENTAL CONSTRUCT

Modern disaster research has effectively skirted the history of disaster – ironically, since much of the impetus for disaster research came from the experience of World War II and the fear of nuclear attack that overhung the 1950s (Williams, 1954). The desire to grasp the dynamics of catastrophic change led to a search for microcosms where it might be most readily studied. In practice, the need for economical and accessible research sites meant that the disaster research literature has been disproportionately concerned with the impact of natural disasters upon relatively small, self-contained communities (Barton, 1969, pp. 58–61). The nature of the cases tended to obscure the range of disaster variation, the extent to which "disaster" lies in the eye of the victim, and the awareness of disaster as a cultural artifact. The cases differ marginally from one another, but collectively they partake of the character of small-to-medium size cities of the last quarter century. That is a relatively uniform population, and in its very uniformity it belies the enormous variation that has historically characterized the human encounter with collective stress. It is a research arena dominated by those stress-events sufficiently well bounded for study, i.e. homeostatic disasters, together with a much smaller proportion of metastatic catastrophes.

"Disaster" is a mental construct imposed upon experience. It is not sufficient to know the number of deaths, the value of property destroyed, or the decrease in per capita income. The symbolic component requires knowledge of the sense of vulnerability, the adequacy of available explanation, and the society's imagery of death and destruction. Why, then, are some collective stress-events perceived as "disasters" while others are received with a stoic sense of the vicissitudes of life? During the long era of homeostatic disaster, the causal factors were unforeseeable, uncontrollable meteorological, biological, and geological forces. In the Western world, the modal forms of disaster have increasingly come to be seen as artificial: total war, colonization, ecological disruption, nuclear attack, and economic collapse now occupy the place in our minds where once storms, plagues, and earthquakes exercised sovereign sway. These artificial disasters have grown increasingly prominent, ironically, at the very point when natural forces were yielding to prediction and understanding. The diminishing perceptual significance of natural hazards receives circumstantial support from a world survey of natural disasters over the period 1947–1967. During that time, the two most technologically ad-

vanced regions – North America and non-Soviet Europe – experienced, respectively, 210 and 85 "disaster impacts." They resulted in an average loss of life per impact of 37 for North America and 230 for Europe. The two least technologically advanced regions – Africa and non-Soviet Asia – experienced, respectively, 17 and 297 impacts, which resulted in a per impact loss of life of 1,065 for Africa and 1,216 for Asia (Sheehan and Hewitt, 1969). The matter, however, is more complex than these statistics indicate. On the one hand, the capacity for warning, control, rescue, and rehabilitation is great enough to "prevent most severe natural disasters." On the other hand, far less has been done than might be to buffer against the effects of natural hazards, suggesting both the denial of unpleasant possibilities and the changing symbolic significance of natural upheavals. We feel a sense of power and invulnerability that is, if not illusory, at least disproportionate. For in fact the complexity of modern societies makes them more rather than less vulnerable. Cities, transportation arteries, and factories present more and larger targets: there is more that might be destroyed. At the same time, the interdependence of industrial societies communicates damage far from the area of immediate impact; few areas are so self-sufficient as to be immune from the consequences of distant catastrophe (White and Haas, 1975, pp. 83–84). Together, these opposed characteristics imply the following conclusions: in relative terms, human life is at greater risk in underdeveloped than in developed societies. However, the greater the level of development, the greater the property which is hostage to natural hazards. The increased vulnerability of our physical artifacts has been allowed to occur precisely because natural hazards no longer signify ultimate cosmic destructive forces. As these forces have passed into human hands, natural hazards, no matter what their objective destructive potential, appear more puny.

In yet another ironic way, the very capabilities that insulate from the full force of nature have also made possible the artificial disasters that bulk so large in the consciousness of the twentieth century. Simultaneous changes in the scope of political, social, and economic organization have magnified the effects of technological innovation. The factors that contribute to the artificial disasters of modern times are so complex and interrelated that they can hardly be dealt with here in anything but a summary fashion. The changing character of warfare alone involves both technological and socio-political aspects: the gunned ship, the citizen army, aerial warfare, the industrial state, and nuclear weapons do hardly more than indicate a few critical turning points. The expanding fiscal, military, and administrative capabilities of Western states have had profound consequences that range from such external effects as colonial expansion to the internal turmoil of systematic political terror. The creation of an urban-industrial order in the nineteenth century had catastrophic effects for traditional society. The interdependence of modern economies has meant that economic dislocations cannot be readily contained; instead, they spread outward through ever-widening networks of mutual dependence.

This litany of destructive potential, far from complete, coexists with the belief that natural forces can be held in check. Where the forces of nature are concerned, disaster defenses have been of two kinds: those that produce a decrease in measureable damage and/or loss of life, and those that, by transforming attitudes, cause us to regard uncontrollable stresses as potentially controllable. To the helpless populace of fourteenth-century Europe, the Black Death ". . . was a man mounted on a great black horse or a giant striding along, his head above the roofs of the houses" (Mullett, 1956, p. 16). Over the intervening centuries, human leverage has increased to the point where ecologists now argue whether in fact human domination over nature has not reached a point of diminishing returns. However that may be, public health and medicine, scientific agriculture, flood

control, and weather and earthquake forecasting provide, in varying degrees, foreknowledge and control. Cases for which neither foreknowledge nor control is currently available or adequate may yet benefit from more efficient mechanisms for evacuation, the redistribution of scarce resources, and the pooling of risks.

Attitudinal changes are equally significant as indices of security. Keith Thomas (1971, pp. 657, 661) argues that the displacement of magic in seventeenth-century England was not related to any objective increase in the degree of security: "The men of the sixteenth century were more or less as vulnerable in the face of epidemics, bad harvest, illness, fire, and all the other environmental hazards as their medieval predecessors. . . In the later seventeenth century the more general rejection of magic was still unaccompanied by the discovery of new remedies to fill the gap." Instead, the critical factor appears to have been an increasing confidence in the potential of human initiative; if scientific prediction and control did not yet exist, they were at least possible in principle. Thus the absence of effective control is not the only way in which a "disaster" can be de-escalated into a mere "hazard." It can also be accomplished when cultures emphasize a sense of control, depersonalize threats, and can satisfactorily account for those instances when control is impossible. The Lisbon earthquake of 1755 produced a lively debate between those who read the event theologically, as a divine warning, and those who postulated impersonal underground forces which might eventually be fitted into a fully functioning scientific theory (Kendrick, n.d.).

A belief in the possibility of understanding and control thus seems to have preceded operational capability. The Occidental view that humanity should dominate nature has deep Hebraic, Greek, and Christian roots (Spring and Spring, 1974). However, more focused optimism in the face of natural perils appears not to have developed much before the sixteenth or seventeenth century. That it did so is all the more remarkable in view of the rigors of the time. The plague did not disappear in England until the late seventeenth century. The period also falls within a longer climatic cycle (1550–1850), during which Europe experienced unusually cold winters and frequent cool, wet summers alternating with droughts (Mousnier, 1970, pp. 312–316). A generalized sense of mastery (also expressed in such phenomena is transoceanic exploration) appears to have reduced the sense of impotence in the face of natural perils out of all proportion to the real technological leverage.

In assessing the attitudinal shift, however, we must bear in mind that it did not occur all at once or without leaving residues of older beliefs. Thus the view that earthquakes in particular signified divine wrath maintained itself right through the eighteenth century, reinforced by the two London tremors of 1750 and the catastrophic events in Lisbon five years later (Garrett, 1975, p. 226). But overall, such attitudes represent the survival of an older worldview that eventually succumbed to secularization. As one moves toward the nineteenth century, the actual ability to rein in natural forces increases, validating earlier, pre-industrial optimism.

DISASTER IN THE TWENTIETH CENTURY

If we are more cynical than our ancestors concerning human capacities, it is because the twentieth century has been a severe teacher. The character of disaster has changed, and not simply in the negative sense implied by the domination of nature. The substitution of artificial catastrophes as the modal forms carries a set of special implications. All are connected with a qualitative shift in scale. The movement of history from the pre-industrial past to the industrial (not to say, post-industrial) present is intimately interwoven with the increasing scale of human enterprise. Concerning the pre-industrial age, Peter Laslett (1965, p. 7) writes, "few persons in the old world ever found them-

selves in groups larger than family groups, and there were few families of more than a dozen members . . . Everything physical was on the human scale . . . Everything temporal was tied to the human lifespan . . . ." The national state, the corporation, the interlocking international economy, the great urban agglomerations, all testify to the expansion accomplished over the past two hundred years.

Human beings have always possessed some capacity for intentionally or accidentally harming their fellows. This capacity, however, has undergone the same scalar shift as the rest of social life. The leap in human disaster capability has brought to the fore three particular characteristics that mark it out both from the relatively puny human actions of the past and the homeostatic disasters that preoccupied an earlier time: unboundedness, in both space and time; a rising potential of self-fulfilling prophecies; and a return to the traditional view that disasters are intentional actions.

Natural disasters emerge out of the rhythms of the physical world. Certain seasons and certain regions are prone to some kinds of homeostatic catastrophes but not others: tornadoes, hurricanes, and tidal waves may sometimes be individually unpredictable, but they do not appear on an entirely random basis. Such events form a niche in communal memory, which may mark off the years of their occurrence – e.g. the "flood of '38." It seems self-evident to say that floods generally occur in flood-plains, but however obvious, the point needs to be made that natural hazards do not skip about the earth's surface; instead they cluster in particular areas that come to know and fear them. Natural disasters have comparable limits in time. Once begun, they move through a life-cycle and depart: a river crests and recedes, an earthquake rumbles on through its aftershocks. This, too, becomes part of the folk-perception of natural hazards. Each peril has its accustomed duration, from which there is little variation.

The spatial and temporal limits are not absolute. Some disasters allow greater variation than others, volcanic eruptions, for example. But perhaps the most notable exception is the epidemic, whose boundaries can only be fixed after the fact. While epidemic disease has its own special geographical loci, the fact that it can spread in far-reaching and complex ways is significant, not only for the loss of life involved, but because its potential for expansion is so much a function of human agency. As André Siegfried points out in his elegant little volume, *The Routes of Contagion* (1965), disease moves by the routes and with the speed that human travel has made possible. The Black Death (1348–1349) prefigures nuclear war not only in the massiveness of casualties but in the scope and duration of its occurrence.

The catastrophes of modern times – metastatic and hyperstatic – may ultimately be found to depend on similar limiting principles, but they are not presently evident. For the cardinal feature of artificial catastrophe is its *unboundedness*. Although technical limits may be discernible after the fact, the French writer on the concentration camps, David Rousset, accurately perceived the apparent repeal of limits when he observed, "Normal men do not know that everything is possible" (Arendt, 1958, p. 303). The same repeal of limits has been noted for warfare since World War I (Elliot, 1972) and for political terror since the 1930's. Concerning the Soviet "Great Purge" of 1936–1938, Walter Connor (1972) speaks of an "elasticity of limits," which permitted the NKVD to mass-produce victims. That there are eventual limits seems clear – the process does not grind on until the last secret policeman executes the last possible victim. However, the evident elasticity goes so far beyond "normal" conceptions of the possible that it effectively constitutes endless disaster.

The modern state and modern technology therefore permit, as Robert Lifton (1968, p. 32) said of the Chinese Cultural Revolution, "induced catastrophe". Wherever such events occur, they seem to outrun the capacity of

potential victims to imagine, let alone cope with, what is about to befall them. In that sense, the incomprehension of the holocaust victims simply reflects the degree to which disaster innovation has overtaken mental categories. As far as natural homeostatic disaster is concerned, the categories remain highly conventionalized. Natural perils may be sorted into a relatively small number of pigeonholes with little disagreement. Their very repetitiveness across generations makes them relatively comprehensible. When Typhoon Ophelia struck the island of Ulithi in the southwest Pacific in 1960, the prevailing reactions tended to be cooperation and interdependence rather than helplessness and paralysis, ". . . probably because cultural conditioning by recurrent typhoons appeared to have minimized fear, panic, and despair" (Lessa, 1964). But the innovative capacity of human endeavor makes it possible to invent new forms of catastrophe. This dark side of social invention is sometimes accidental. Thus the integration of local electrical grids reduces the possibility of minor blackouts but creates the opportunity for massive, disabling power failures (Hewitt and Burton, 1971, pp. 76–77). However, other forms of disaster invention are conscious and calculated, such as large-scale political terror.

If unboundedness is one hallmark of man-made disaster, another is the rising potential for self-fulfilling prophecies. Where human beings are at the same time the causes of disaster and its victims, predictions of catastrophe can take on lives of their own; they can produce effects quite independent of their initial validity (e.g. Merton's (1948) commonly cited example of the bank which becomes insolvent because false reports induce a run on deposits). One cause of the self-fulfilling disaster prophecy is the aggregation of protective reactions to produce the very result they were meant to forestall. The independent protectionist policies of separate countries may create an international trade collapse. Secondly, the multiplication of disaster predictions can itself create a heightened awareness of possible danger. In an atmosphere of war rumors, the listeners to Orson Welles' 1938 *War of the Worlds* broadcast were all too ready to believe the worst (Cantril, 1940, pp. 159–161). Alternatively, the sheer volume of predictions can induce a fatalistic acceptance, a belief that the inevitability of the threat makes counter-efforts pointless (De Nike, 1972). Victims may be induced to regard human threats with the same inevitability once reserved only for earthquakes and tornadoes. The scope of manmade disaster opens the possibility of a double-bind situation for victims: if they face the full dimensions of a peril, they risk psychic paralysis. On the other hand, failure to confront it can prevent them taking whatever steps might be possible to mitigate the damage. A subtler aspect of the problem is the possibility that perpetrators and victims may fall into a circular relationship in which the victims' increasing passivity serves as a confirming message to perpetrators who have not yet decided to act.

Finally, there is the problem of intentionality. A traditional orientation towards natural disaster was, "It's in the hands of God." This link between catastrophe and conscious action anthropomorphized otherwise incomprehensible forces and caused the victim to accept blame for his fate. The question, "Why me?" was often answered, "Because I deserve punishment." Lifton's (1967) work on the Hiroshima survivors and that of Krystal and Niederland (1971) on concentration camp inmates have been responsible for raising the issue of survivor guilt. Thus, the so-called "survivor syndrome," with its heavy emphasis upon victim guilt, seems very much a product of the twentieth century. Lifton and Olson (1976) found similar reactions among the survivors of a Buffalo Creek, W.Va., flood, although, significantly, the flood was more the result of coal company negligence than of purely natural forces.

The pre-industrial period was prone to regard natural disasters as punishment for sins, the means by which a watchful deity secured the moral governance of the world. In the absence

of compelling naturalistic explanations, it was neither irrational nor implausible to ascribe disasters to supernatural intent. Vestiges of pre-industrial attitudes remain. William James described the San Francisco earthquake as a presence that "stole in behind my back" (Rosenman, 1956). Rural populations – less touched by secular-scientific thought patterns and more vulnerable to nature – may continue to construct elaborate theological explanations. However, even bearing in mind the time-lags and inconsistencies, a changed conception of intentionality runs parallel to the shift from natural to artificial disaster. We have already seen that three significant changes have occurred: (1) natural catastrophes have become subject to scientific explanation and, often, prediction; (2) natural hazards are believed to be controllable and hence may be perceived as less threatening; (3) we are increasingly likely to categorize artificial stresses as "disasters". These developments have brought corresponding changes in the manner in which we conceive intentional action. Despite vestigial remnants, natural catastrophes can be more convincingly dealt with in secular-scientific than in theological terms. More to the point, we are less prone to categorize a natural hazard as a "disaster": if not controllable at the moment, it soon will be. For all of these reasons, the personification and intentionality of natural forces has been replaced by a tendency to see them in neutral, non-intentional terms. Since natural hazards do not occur "on purpose," there is less tendency to blame the victim for his own suffering.

Intentionality has been transferred to the relatively new category of humanly caused disasters. Rue Bucher (1957), discussing a series of airplane crashes in Elizabeth, N.J., in 1951–1952, observes that "the assessment of responsibility was dependent upon some conception of the causation of the disasters, together with the belief that it was possible to do something to prevent their recurrence." The catastrophes that now preoccupy us flow from human actions, for which we must formulate conceptions of causation that differ both from the "divine punishment" view of pre-industrial times and from the "neutral forces" perspective from which we evaluate natural hazards. When disasters are artificial, "victimization cannot be random . . ." (Krystal and Niederland, 1971, p. 39). It is possible to make distinctions among stated intention, action taken in ignorance of its consequences, and accident; indeed, the law does so as a matter of course. However, the subtle gradations visible to outsiders are unlikely to be perceived by survivor-victims. They adopt a simpler causal view: if human actions created the crisis, those actions must have been intentional. Melvin Lerner (1970) argues that we all wish to believe that the world is just. His "just world paradigm," for which a substantial amount of experimental support exists, suggests that "We want to believe we live in a world where people get what they deserve or, rather, deserve what they get."

The "just world paradigm," as it applies to artificial disaster, suggests a symbiosis among victims, harmdoers, and bystanders. Each assumes the rationality of human actions and assumes some variety of moral consistency. While it is by no means the only strategy to adopt, many disaster situations resolve themselves into an exercise in blaming the victim, in which, paradoxically, the victim himself may be a major participant. It seems no easier for contemporary victims to regard their harmdoers as evil or inept than it was for pre-industrial victims to view God as malicious or arbitrary. So far as intentionality is concerned, therefore, we have come full circle, back to the view of purposeful disaster characteristic of an earlier time.

ADAPTING TO DISASTER

"Community" is normally thought to be a group whose members share common benefits. In fact, however, by entering a community one becomes fully implicated in the fate of others, as subject to vulnerabilities as to benefits.

Metastatic and hyperstatic disasters have shattered the temporal and spatial boundaries of natural, homeostatic catastrophe. That has been possible because technology and organization can produce stress on an unprecedented scale, and because that stress spreads along unprecedentedly broad lines of mutual dependence. In the past, only epidemic disease prefigured the expanded character of artificial disaster. Global lines of contact now link human beings in widening networks of mutual benefit and jeopardy. In paradoxical ways, economies of scale associated with industrialism have simultaneously diluted and expanded risks. International trade, electric power grids, floating monetary exchange rates, dependence upon fossil fuels, and nuclear deterrence suggest but do not exhaust the ambivalent characteristics of modern life. The same innovations that enrich and protect them also make communities and nations hostage to one another. Risks, like benefits, spread outward through ramifying patterns of human interaction. A bank's collapse, a crop failure, or a guerrilla war cannot be assumed to have only local consequences. Thus community has proven to be a two-edged sword: on the one hand, it relieves local stresses; on the other, it makes us all potential co-victims.

The communication of stress along lines of interdependence has a cognitive dimension. The scope of disaster is measured both by its observable local effects and the framework of knowledge that permits victims to associate their own hardships with distant events. Networks of communication help to define the scope of modern disaster by aggregating local events into large-scale patterns. In the past, when horizons of experience were narrow, all events, including disasters, were local. If one lacks sure knowledge of events fifty miles away, there is no way of knowing whether one shares a disaster with inhabitants of distant villages. Occasional travelers might bring word of far-off misfortunes, but such news was subject to delay, distortion, lack of detail, and the inability to confirm it. Hence, in the pre-industrial past disaster was perceived as local whether or not damage ranged over a larger area. The segmented character of pre-industrial life – made up of numerous, relatively self-sufficient groups – contributed to the perceptual segmentation of disaster.

As horizons of experience broadened, so too did the awareness of disaster. The "real" limits of disaster damage began to coincide with its cognitive boundaries. The effect of modern communications was to aggregate many separately perceived local disasters into larger, more inclusive sets. A "flood" became the inundation of an entire river basin rather than the submerging of single towns repeated over and over again. A "plague" came to be seen as a continental or trans-continental pattern of morbidity and mortality rather than the affliction of individual, self-contained communities. Consequently, widened patterns of interdependence made disaster "larger," if only because both victims and onlookers could finally know its broadest extent. Beneath the surface, of course, lies an epistemological question: what do we *know* disaster to be, and through what means of knowing? Access to a wider range of information allows the reconceptualization of catastrophes, through the assembling of information about collective stress into mental packages that reflect a concern for nations and continents instead of villages and regions.

The *quality* of communication is another matter. Disasters produce the paradox that the need for information rises at precisely the moment that normal channels of communication may be destroyed (Larsen, 1954). Since people in crisis abhor an informational vacuum, rumors rush in, facilitated by the breakdown of conventional social barriers (Shibutani, 1966, p. 34). In the absence of clear and unambiguous evidence, victims and prospective victims are likely to view the threat in terms consistent with the prevailing conception of "normal" events. Many listeners to Orson Welles' *War of the Worlds* broadcast who scoffed at the idea of a Martian attack did believe that the program

reflected an invasion from Germany or Japan (Cantril, 1940, pp. 159–161). This phenomenon, of course, reflects the well-known disposition to interpret ambiguous stimuli in familiar terms (Hudson, 1954).

The interpretive process for artificial disasters appears to operate within a looser set of constraints than it does for natural catastrophes. As the earlier discussion of homeostatic disaster suggested, the more clearly patterned character of natural cataclysms gives them a secure place in communal memory, folklore, and traditional wisdom. Indeed, patterning may reach the point where potential victims become socialized to a specific set of expectations about natural hazards. Moore's (1964, p. 195) concept of the "disaster culture" of hurricane-prone areas is a case in point, for it

> . . . would include those adjustments, actual and potential, social psychological and physical, which are used by residents of such areas in their efforts to cope with disasters which have struck or which tradition indicates may strike in the future. These defenses include such diverse elements as folk tales of riding debris for days and construction of seawalls. But at the core is an attitude of defiance and of pride in ability to "take it" expressed in vehement refusal to flee before the winds.

The prevalence of "disaster cultures" depends in part on the frequency with which a particular kind of hazard occurs. Thus, we would expect hurricanes and tornadoes to be incorporated within the socialization process more readily than, say, earthquakes. The overriding point, however, is that insofar as natural hazards reflect the patterns and periodicities of nature, they can be taken account of before the fact; and, further, that they may be taken account of through specific forms of adaptation. The result is both a psychic and a material readiness to accept and bounce back from natural stresses (Dynes, 1970, pp. 69, 78).

The paradox of adaptation lies in the fact that the greater the disaster readiness, the less likely that the stress will constitute a perceived disaster. All natural hazards are not disasters, for surely one central element of "disasterness" is the shock of impact. Whatever mitigates that shock also routinizes stress. Now, of course, we cannot simply divide stress events into watertight compartments, labeled "disaster" and "routine hazards." A routine hazard – for example, a snowstorm in a northern area – can reach an intensity that exceeds the adaptive capabilities of the indigenous disaster culture. A relatively unfamiliar hazard – a tornado in an area that rarely sees one – may be dealt with fairly expeditiously by relief measures designed for other forms of stress. There will always be such cases clustered in the middle range between stresses that are both intense and novel and those that are mild and routine.

But disaster is, as much as anything else, a socially conditioned category. To define it without an awareness of its relativity is to miss an important element; a disaster is more than simply "an event located in time and space in which a community undergoes severe danger and incurs losses so that the social structure is disrupted and the fulfillment of all or some of its essential functions is prevented" (Dynes, 1970, pp. 69, 78). The social context provides characteristic ways of understanding. When collective stress falls well within those ways of understanding, the response is likely to be the patterned behavior associated with a "disaster culture": people go about their business with minimum disruption of routine; each knows the behavior that the community expects. As collective stress moves up to and beyond the margins of conventional understanding, two things happen: the psychological shock of the unfamiliar is added to physical damage; and the victims cannot cope with the stress by fitting into any ready-made roles. The "disaster syndrome" – that dazedness and passivity so often noted in some survivors – bulks larger as the stress moves beyond conventionalized boundaries.

How communities adapt to collective stress forms a particularly critical question where artificial disaster is concerned. The patterned character of most natural disasters limits their shock effect and increases the coping abilities of

the community. This patterning is more likely to be absent where the catastrophe results, accidentally or purposefully, from human action. One reason why coping is more difficult is the unboundedness of artificial disaster. Not only is the element of surprise likely to be much greater, but the disaster much more readily exhausts the community's recuperative abilities. Fred Iklé (1958, pp. 8, 11) points out that "A decline in resources on account of destruction is not necessarily accompanied by an equivalent decline in the number of consumers who can be served by those resources." He goes on to note that as the ratio of consumers to resources increases, the resources that remain – food, lodging, transporation, medicine, and so forth – must be stretched to accommodate the rising demands. The elasticity of resources permits more individuals to be served by fewer facilities; four may live in rooms that once housed only two. Thus far the argument simply reflects the adjustive processes that have always characterized rational attempts to cope with disaster. However, the transition from natural to artificial disasters suggests new limits on the elasticity of resources. The level and scope of destruction may now quickly surpass the ability to make do with less:

> Increasing destruction leaves an ever smaller amount of resources to cushion the impact by increasing the consumer-resources ratio. The elasticity of resources is limited. In other words, after physical destruction exceeds a certain percentage of a city's total resources, further increase in destruction will result in a disproportionately greater increase in social effects . . . The phenomena of elasticity and disproportionality apply not only to cities but also to regions or to a country as a whole.

We must be sure not to overdraw the point: there have been natural catastrophes with precisely these effects. Indeed, such effects were not uncommon in a pre-industrial, pre-scientific age, when natural forces were neither controllable nor believed in principle to be controllable. However, we have already seen that beginning in about the late seventeenth century, the orientation towards natural forces became markedly more optimistic and manipulative. There then ensued a period, lasting up to about the middle of the nineteenth century, in which natural forces grew less threatening without human forces having as yet taken on much greater destructive capacities. The ability to exhaust a society's coping capacity is now in the hands of human rather than natural adversaries. In short, the world has become more threatening, not only because absolute levels of possible destruction have risen, but because the capacity to absorb destruction has not risen with comparable speed.

There is also a perceptual dimension. Except in extremely rare instances, natural catastrophes could be referred back to comparable experiences of past generations. Nature's capacity for surprise is distinctly limited. Not so with man. Innovative capacities continually open up new vistas on the "unthinkable". As "all things become possible," the cultural capacity to adjust to new possibilities falls behind. It is difficult to create a contingency plan for inconceivable contingencies. The application of human ingenuity to the production of disaster thus opens vistas of misfortune faster than our capacity to assimilate them. The litany of contemporary disaster consciousness reflects this headlong growth: nuclear war; overpopulation and food shortages; ecological imbalances, including depletion of the ozone layer and thermal pollution; collapse of the international monetary system; sudden unavailability of fossil fuels; race war on a national or international level; a chain-reaction of technical malfunctions in power networks and communication systems (e.g. Heilbroner, 1975). One need not complete such a doleful catalog in order to recognize a peculiar contemporary receptivity to disaster themes: they threaten to saturate both popular culture and intellectual discourse. Nor, at this point, is it particularly significant which probabilities we assign to specific hazards. Rather, the consequential considerations are these: (1) the attitudinal and scientific-technological developments that deprived natural hazards of their sting have now been widely identified as

the *causal* factors in the new disaster modalities; (2) projected artificial disasters can assume so many possible forms that effective prediction becomes extremely difficult; (3) specific fears have given way to a less focused, more diffuse apprehension: *something* will happen, although no one is sure quite what form it will take; (4) a non-specific and pervasive expectation of artificial, hyperstatic disaster may become a self-fulfilling prophecy.

Is it possible to shape adaptive responses to artificial disasters? Of course. The most obvious cases occur in small, metastatic disasters at the community level, such as mine and industrial explosions. As disaster shifts to hyperstatic, society-wide forms, adaptation becomes more difficult, as Iklé's principle of the limits of resource elasticity sets in. Further, where rates of technological innovation are high – as they have been in recent years and are likely to be for the foreseeable future – each new collective stress is likely to differ from those to which the society has already been subjected. One cannot count upon the accumulation of transferable skills. The shock of unfamiliar stress may blunt the utilization of those skills that remain useful. The association of artificial misfortune with intentional action increases the likelihood of survivor guilt, although the sense of unworthiness and self-punishment may not show itself until months after impact. The matter is further complicated by the relationship between the *scale* of disaster, on the one hand, and, on the other, its *familiarity*. It seems to generally hold for artificial disaster, that those of greatest intensity seem to be both least frequent and least likely resemble one another. The most severe artificial disasters most directly reflect the pace of technological change.

The declining ability to learn from past disasters militates against more rational responses to future catastrophes. The rapidity of social change carries forms of disaster with it and endows the future with an air of both menace and resignation. At times the recognition of disaster uniqueness reaches the level of an identifiable mood, a predisposition to expect the worst from any quarter and, ultimately, a desire to resolve the ambiguity by having "the other shoe drop." Many writers on the period before World War I have pointed to this premonitory form of disaster readiness. George Steiner (1971, p. 24) describes the period as "the great ennui":

> . . . by ca. 1900 there was a terrible readiness, indeed a thirst for what Yeats was to call the "blood-dimmed tide." . . . The arms race and the mounting fever of European nationalism were, I think, only the outward symptoms of this essential malaise. Intellect and feeling were, literally, fascinated by the prospect of a purging fire.

In retrospect, those who partook of this mood hastened the slippage into war. A similar case may be made for the past decade, with its parallel feeling of teetering upon the edge of events that seem to be as consequential as they are unfathomable. As the premonitory mood enters mass media of communication, it is rapidly diffused through virtually the whole of a society, a process Greisman calls (1974) "marketing the millennium."

In short, the contemporary cultural construct of "disaster" departs markedly from the micro-disasters that have been so extensively studied in communities over the last quarter century. While community catastrophe research has had very real benefits in the work of rescue and rehabilitation, it does not – and, indeed, could not be expected to – address the massive cataclysms of the twentieth century (Barton, 1969, pp. 58–61). These society-wide locations are the modal catastrophes of modern times. The empirical grist of disaster research thus turns out to be less bona fide "disasters" than foreseeable and largely controllable hazards. As "disaster" has changed its locus from nature to man and from small-scale to large, the mine explosion, the tornado, the hurricane, no longer fully reflect its properties.

SUMMARY

Western history since c. 1750 has been

characterized by the sequential emergence of three disaster modalities: homeostatic, metastatic, and hyperstatic. This sequence may be characterized as involving shifts from bounded to pervasive catastrophes; from short-term to long-term stresses; from natural to artificial causes; from perceived solvability to insolvability; and from narrow to broad substantive content. Metastatic disaster accompanied the rise of industrialism after about 1750; while artificial in its causation, it was still of limited scope and duration. Beginning about 1930, artificial catastrophe began to assume forms of increasing intensity, scope, and duration. These hyperstatic catastrophes have become modal for the present period, with concommitant strains placed upon society's capacity to adapt to novel collective stresses.

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PARTIAL RECOVERY AND RECONSTRUCTION AFTER DISASTER: THE LICE CASE*

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INTRODUCTION

Natural hazard research includes the examination of human adjustment to earthquake disasters. The importance and need for empirical case studies of earthquake disasters have been recognized for both developed and developing countries (White and Haas, 1975; "Disaster Assistance: Earthquake Hazard Reduction" no date; and *Earthquake Hazard Minimization Conference,* 1968). This report, like an earlier Gediz study (Mitchell, 1976) is a systematic case study appraising the restoration after an earthquake disaster in Turkey (Mitchell, 1976). It is designed to partially assist in meeting the need for research on post disaster recovery [1].

Asia Minor, the land mass that is now Turkey, has experienced devastating earthquakes for thousands of years. According to the American National Geophysical and Solar-Terrestial Data Center, over 700 earthquakes of Richter magnitude 4.0 or greater have been recorded in this area since 1900. For the past several decades, an average of at least one earthquake measuring 6.0 Richter magnitude or greater has been recorded in Turkey. Recent disasters (in Varto, 1966; Gediz, 1970; Burdur and Bingöl, 1971; Lice, 1975; and Muradiye, 1976) further demonstrate the vulnerability of a country that is located in an active seismic zone (Fig. 1). The seriousness of this earthquake threat is quite evident when considering the extremely poor quality of housing construction throughout most of Turkey.

Based on the Turkish Earthquake Research Institute's 1972 map of earthquake zones in Turkey, over 90 percent of the 780,576 kilometers squared area of the country, containing about 95 percent of the total population (40,197,669 population in 1975), are located in earthquake zones (Fig. 2). The Lice region is located in earthquake risk degree III zone; however, the region borders zone II, and is less than 100 kilometers from zone I, the highest risk area of Turkey.

DİYARBAKIR PROVINCE

Diyarbakır province, in which the disaster area is located, is situated south of where the anti-Taurus mountain range begins its curve around the Tigris river (Dicle) basin and turns toward the southeast where it then connects with the Zagros mountains of Iran. The province is located close to the juncture area of the North Anatolian and East Anatolian

* The views expressed in this article are those of the author and do not necessarily reflect the opinion of the United States Air Force Academy or the United States government.

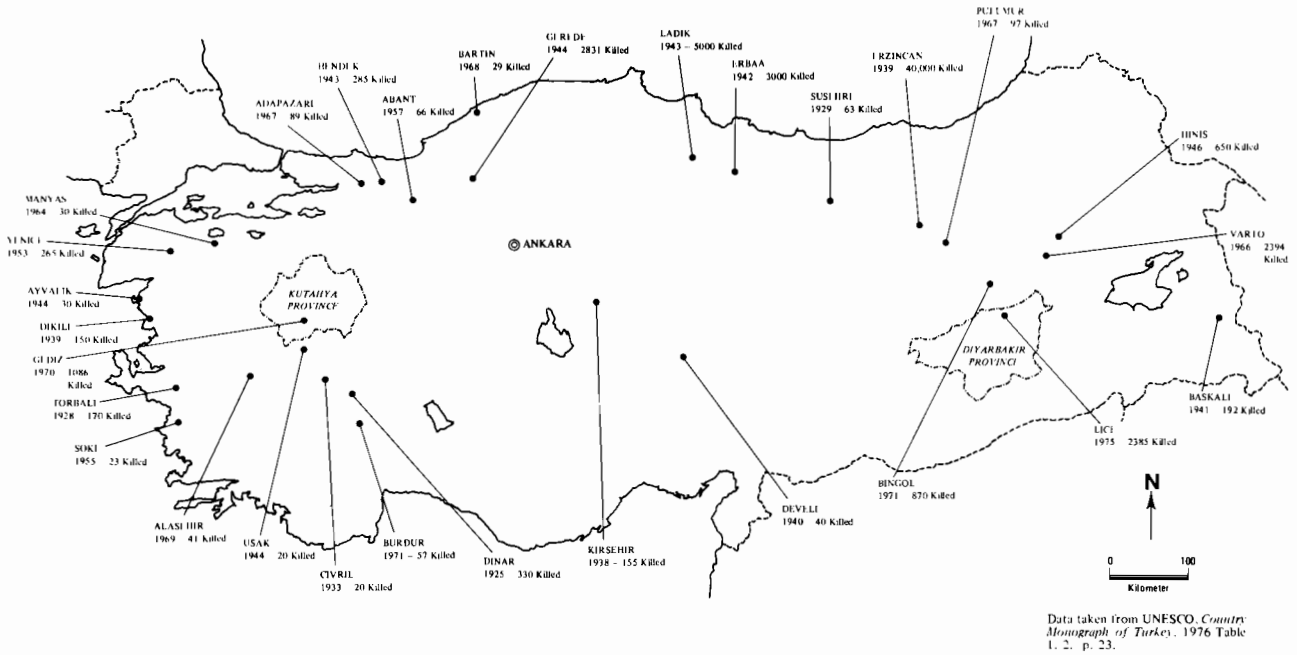

Fig. 1. Earthquakes with more than twenty fatalities (1925–1975).

fault systems. Lice town, situated practically on the epicenter, is located 75 kilometers north-northeast of Diyarbakır, on the very edge of the anti-Taurus mountains.

Many villages in Diyarbakır province expand outwardly to form scattered quarters (*mahalle*) (Tunçdilek, 1974). Thus, there are several sections or settlement cores of a village that are physically separated often by several kilometers, and cover a relatively large area [2]. These dispersed settlements are a result of rough relief features, poor soil conditions, and various socio-economic factors. It is a pratical settlement type for the predominantly livestock economy found in much of the province.

Diyarbakır province is populated largely by Kurds, an ethnic minority in Turkey [3]. Estimates of Kurds in Turkey vary greatly, ranging between three and eight million. Turkish statistics suggest about two million Turks are Kurds, or "mountain Turks" as Kurds are officially labeled. It is illegal to teach Kurdish or to dress in Kurdish costumes. It is a perplexing situation; the disaster is located in an area with its own unique sub-culture, yet it is undiplomatic to even mention the word "Kurd".

Kurdish culture includes an Indo-European language that is closely related to Persian, rather than Turkish (Ural-Altaic), and contains many dialects. The Kurds are divided by dialects which form geographical boundaries more than political ones. Most are Muslims. Families are headed by the oldest male member in a patrilineal and patrilocal structure, with primary loyalty to the family, the dominant social and political unit.

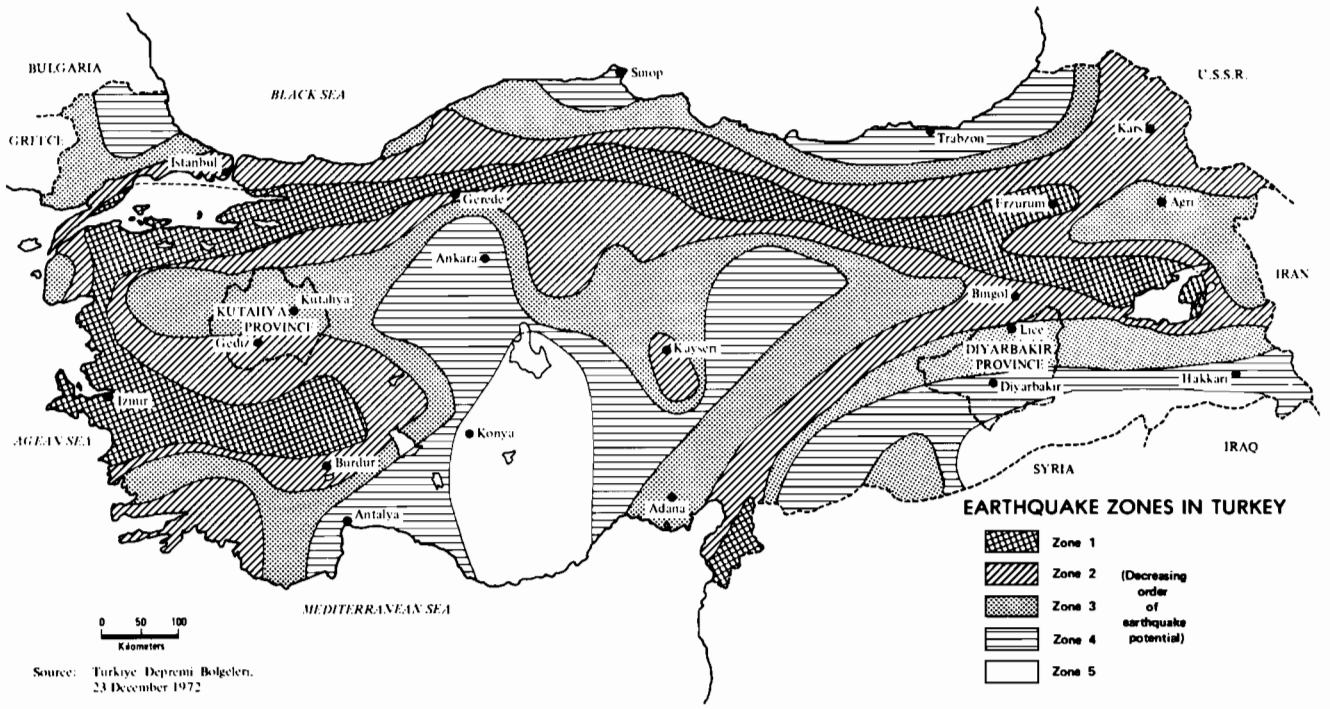

Fig. 2. Earthquake zones in Turkey.

The central government tends to minimize the differences between "mountain Turks" and other Turks. It has been suggested that the reconstruction of Lice may be used by the government as a means of acculturating them into the majority society [4].

The disaster area is sparsely populated and the Kurds are principally engaged in raising sheep, goats, and cattle, and in more recent times sedentary subsistence farming of wheat, barley and corn. Although there are areas of intensively cultivated alluvial soils along stream beds, the land generally is of poor agricultural quality and mostly farmed on a sharecropper basis. Diyarbakır province lags behind the national average in mechanization of agriculture, in motor vehicles, and in banking facilities. Literacy is also lower in the region than in most other regions of Turkey. It is an area with high birth rates and limited medical facilities.

Communication between village and town is a serious problem in the area. Although the district centers are connected by all-weather roads of fairly good quality, I found it impossible to travel to several villages because of the road conditions. Many villages have no roads suitable for motorized vehicles of any type.

SEISMICITY OF THE LICE AREA

The earthquake occurred at 12.20 hours local time on September 6, 1975. The epicenter of the main shock was only a few kilometers northeast of Lice, at 38.57 degrees north and 40.80 degrees east. Preliminary reports placed the magnitude between 6.6 and 6.7 on the Richter scale, but final measurements verified the average magnitude at 6.9. The main shock was felt over an area of 210,000 squared kilometers (Yanev, 1975:7).

Focal depth was between 15 to 25 kilometers and the shaking lasted between 20-24 seconds (statement by the Turkish Delegation on Earthquake at Lice, Turkey, 1975:1). Aftershocks continued for over a month. Smaller aftershocks on 25 September 1975 caused additional damage and several casualties.

Although some damage occurred in the districts of Dicle and Hazro, the major damage was in the region between Hani, Lice, and Kulp. Historically, there have been low magnitude earthquakes along the Çermik-Hani-Lice-Kulp fault system, but fortunately no damage has been recorded. Of course, on a larger scale, the nearby region has not been as fortunate.

LICE: AN EARTHQUAKE SCENARIO

The town of Lice was situated in rows of terraces on the south side of a steep mountain. The town consisted of 13 sections (*mahalle*) containing 2,238 homes: Cami Kebir (58); Çarsi (105); Delvan (111); Kali (245); Kalvan (237); Karahasan (261); Kaya (68); Körtük (200); Mirminağa (142); Molla (158); Muradiye (104); Şaar (386); and Yenişehir (163) [5].

Twenty minutes after the noon hour on Saturday, September 6, 1975, a large percentage of Lice's 8,093 people were in their houses resting. Very few were eating since it was early in the month of Ramazan, a time of religious fasting. Many others were walking along Carşi, Hukumet, Koprubaşi, Cortyol, Kulp, Yenişehir or other streets. Some were working in the two bakeries, in the four mills, in the six barber shops, and in the five hotels. The town's movie would not be open until dark. The public bath was open, as was the post office, telephone and telegraph office. The three elementary and one high school were closed. A very few were eating the noon meal in the various *lokantaler* in Lice. A few others were having coffee or tea in one of the seven coffee houses. Still others were washing their face, hands and feet in the mosque washing fountains.

The disastrous shaking began suddenly, with no warning. Large boulders were broken off the top of the mountain and rolled down onto and through the town. The horizontal shaking quickly collapsed tons of stones, mud and logs from the roofs of houses, onto the people inside.

The result was awesome. According to the mayor, about 1,500 people were killed in Lice. The death toll throughout the disaster area was 2,385, with 3,339 injured. As terrible as the disaster was, it could have been far worse. Obviously, had it been late at night, or in the winter, or during rainy weather, casualties would have been far greater. Twelve of Lice's *mahaller* were completely destroyed. The thirteenth, Yenişehir, suffered 21 homes totally destroyed. However, more than houses were destroyed in Lice. Damages included 17 official structures, 132 commercial buildings, 6 schools, and 6 mosques [6].

All of the government and public buildings in Lice were destroyed or badly damaged. Included are the state hospital, located on the western edge of town, the high school, boarding school, gendarmerie building, old municipality building, government houses, and the new municipality building. Early reports of property damage were estimated by Turkish officials at between seventeen and eighteen million dollars.

NATIONAL AND INTERNATIONAL RESPONSE TO THE DISASTER [7].

The series of responses to disasters are well documented for developed nations, but only minimally documented for developing societies (Barton, 1970). Turkey, as all developing societies, faces extreme difficulty in coping with the events immediately following an earthquake disaster (Mitchell, 1976: 303-304). Political instability and bickering can hardly assist in a major reconstruction program. The role of a strong central government is critical during the initial relief and subsequent recov-

ery periods following a disaster in a developing country. Based on local press reports, which must be interpreted with some care, there was political controversy concerning Prime Minister Demirel's decisions and intentions in directing the government's reconstruction efforts [8]. Bulent Ecevit, one of the Prime Minister's major political opponents, reportedly charged gross negligence and ineptness in the disaster recovery program. As one might expect, in contrast to the Ecevit and other political leaders' charges, Demirel's party continually claimed extreme efficiency in dealing with the Lice relief effort.

Turkey developed an improved plan to organize emergency and relief services after the 1966 Varto earthquake disaster (UNESCO, 1976:51-52). The plan has been tested by the Gediz, Burdur, Bingöl, and Lice earthquakes.

In accordance with the plan, the Central Coordinator Committee for Natural Disasters was called into session when the news of the earthquake was relayed from Lice to the Diyarbakır governor's office to the Ministry of Reconstruction and Resettlement in Ankara. Undersecretaries from the Ministries of Reconstruction and Resettlement, the Interior, Health, Defense, and the Director of the Turkish Red Crescent (Red Cross) were called into session. While the Central Coordinator Committee was convening, the Diyarbakır Provincial Relief Committee, headed by the governor and consisting of the Diyarbakır mayor, gendarmerie commander, secretary of civil defense, chief of police forces, Red Crescent director and the military forces commander, were implementing emergency plans for immediate rescue and relief for the victims. Urgent actions are necessary in any disaster, and the reaction to the Gediz disaster saved many lives. Similar urgent actions were reportedly repeated in Lice.

The Diyarbakır Provincial Relief Committee established sub-committees for emergency rescue and ruin removal, tent distribution, health affairs, food distribution, evaluation of damage, and security. The sub-committees carried out their functions in Lice, Hani, Kulp, and other damaged settlements.

Military personnel arrived in the area about three hours after the disaster and began rescue operations. A helicopter shuttle was established between a central storage point in Diyarbakır and an area near Lice. Helicopters also brought vital assistance to the scores of isolated villages in the region. Bearing in mind the potential for political conflict in this region, since it has been under martial law several times, the 15,000 Turkish soldiers could have been a very controversial subject. During my visit, the soldiers had completed their mission, and had returned without causing any additional problems.

Immediate attention was focused on rescue, medical care, shelter, and food. Ambulances, taxis, trucks, and private cars jammed the road to Lice, trying to get into the area to provide assistance in rescue efforts. An army engineering batallion brought in cranes, bulldozers and graders to clear the debris and assist in searching for survivors. On the same day of the earthquakes the Prime Minister and Minister of Reconstruction and Resettlement visited the area.

After the immediate rescue phase, the government's main objective was to provide permanent housing for the survivors. Before construction could begin it was necessary to evaluate the damage. The Earthquake Research Institute of the Ministry of Reconstruction and Resettlement did the evaluation, with assistance from Ankara and Istanbul university departments. The Ministry officials visited settlements and classified damage to houses. Settlements were visited and classified, by house and buildings as: not damaged, lightly damaged; moderately damaged; heavily damaged or destroyed. Based on this classification, an individual would be able to claim aid and new housing assistance.

If a settlement could be restored safely and economically on its original site, it usually

was. If the original site was declared geologically unsafe, the settlement was rebuilt on a new location. Lice was declared unsafe and a new site was chosen after the Department of Geological Investigations, General Directorate of Natural Disasters Affairs, conducted geological soundings and soil tests in the new area.

Private construction contractors sometimes construct villages, and even when construction is carried out by the Ministry of Reconstruction and Resettlement, much of the project can be subcontracted. This is especially true of the public facilities such as roads, water lines and wells, and electricity and sewage facilities.

Construction bids from private industry are usually received by government officials when an entire village or town must be rebuilt. In many cases, the Ministry of Reconstruction and Resettlement constructs the new settlements (see Table I). The individual who receives a new home is usually required to accept a 20-year low or no-interest loan. Sometimes the debt is cancelled after a few years, depending on the government or bank official's perception of the individual's ability to pay.

Three days after the disaster, the Turkish government appropriated about 34 million dollars (500 million Turkish lira) for rehabilitation and reconstruction. This compares with 50 million dollars after Gediz, 25 million after Burdur, and 28 million after Bingől (Mitchell and Glowatski, 1971:229; Keightley, 1975:1).

International assistance was prompt and extensive [9]. A total of 14,837,058 dollars in assistance was received by Turkey from private and government foreign sources (see Table II). The United States, through its Ambassador to Turkey, donated an amount equivalent to 25,000 dollars to the Turkish Red Crescent on 9 September 1975. The U.S. Office of Foreign Disaster Assistance, Agency for International Development, assisted by providing a grant of 200,000 dollars to Turkey through the League of Red Cross Societies. The U.S. government also paid part of the transportation cost of materials and equipment donated to Turkey by the London OXFAM organization for construction of 800 polyurethane "igloo" style shelters in the disaster area. However, by far the largest government contribution was that given by Saudi Arabia.

TABLE I

Turkish Supplied House Types[1] (Ministry of Reconstruction and Resettlement)

District	Village	Houses Scheduled	Houses Completed
LİCE	City	1,615	1,615
	Budak	43	0
	Kıpçak	139	75
	Kıyı	60	30
	Sıgnak	44	44
	Dallıca	31	10
	Baharlar	58	42
	Yorulmaz	75	16
	Dibek	83	83
	Bekirhan	29	29
	Ecemiş	87	0
HANI	Okur	42	0
	Topçular	51	51
	Gürbüz	223	155
	Ahil	40	22
	Kirim	49	49
	Süslü	22	0
	Kalaba	77	27
	Marık (Seren?)	14	0
KULP	Kaynak	20	0
	Elmalı	32	0
	Bozova	20	0
	Altay	30	1
	Kocaalan	45	0
HAZRO	City	100	0
Total		3,029	2,249 (74%)

[1] Provided by T.C. İmar ve İskân Bakanlığı, Bölge Müdürlüğü, Diyarbakır, Turkey (Diyarbakır Regional Director, Ministry of Reconstruction and Resettlement), June 1976.

TABLE II

International Assistance for the Lice Disaster (Government and Red Cross Societies)[1]

Country	Assistance	Country	Assistance
Afghanistan	$ 3,035	Libya	$ 1,000,000
Australia	3,003	Luxembourg	13,941
Belgium	84,877	Monaco	1,124
Brazil	1,012	Netherlands	529,711
Bulgaria	57,600	New Zealand	2,102
Canada	47,097	Norway	70,731
Peoples Republic of China	51,592	Pakistan	994,384
Denmark	32,121	Poland	4,856
France	19,282	Romania	112,482
Democratic Republic of Germany / Federal Republic of Germany	10,739	South Africa	813
		Saudi Arabia	10,000,000
		Spain	4,349
		Sweden	72,407
	129,220	Switzerland	461,518
Greece	3,649	Taiwan	21,468
Iran	129,910	Thailand	256
Italy	110,840	Tunisia	1,263
Ireland	964	United Arab Emirates	9,995
Japan	16,896	U.S.S.R.	19,180
Jordan	780	United Kingdom	37,406
Republic of Korea	10,939	United States	258,892
Kuwait	503,407	Yugoslavia	2,862
Liechtenstein	375		
		Total	$ 14,837,058

[1] Calculated from tentative data provided by Office of U.S. Foreign Disaster Assistance, Agency for International Development, Department of State, August 12, 1976.

An ambulance was donated to Lice by the Netherlands. There was controversy about whether the vehicle was being used for its intended purpose. Some villagers claimed that an expensive fee was charged for its use. In any event, there are vehicle operating costs which must be paid.

Although international aid was prompt and extensive, donor agencies continued to provide assistance that conflicted with cultural preference or actual needs of the people in this region. As in the Gediz disaster, and later in the Çaldıran (Van) earthquake, unfamiliar canned food, along with the tons of donated medical supplies, were either sold for animal food or stored away probably never to be used again [10]. Many villagers were suspicious that the food might contain pork or pork by-products. This is taboo in the Islamic society of Turkey. Western style womens' dresses were also a wasted donation.

THE NEW TOWN OF LİCE

On 11 September, just five days after the disaster, a geological investigation was completed by the Earthquake Research Institute officials, and a new site for Lice was chosen. The new location is about two kilometers south of the old city, and unlike in the town of Gediz, in western Turkey, which was not totally destroyed, practically all the residents live in the new city (Mitchell, 1976:88).

Fifty-four days after the disaster, on 29 October, 1,568 houses had been built. In addition, 40 shops, an elementary school, a mosque and a bakery were also finished. The new

town's infrastructure included 28 kilometers of stabilized streets, 901 electric power poles, 32,050 meters of electric power lines, and 22,463 meters of water and sewage lines (*Yeni Lice,* 1975:15). The release of this date by the Demirel officials was quickly attacked by political opponents and subjected to lengthy discussions in the news media.

Ten months after the earthquake, Lice was almost completed. Final plans were for a total of 2,327 homes, 12 bakeries, 4 mosques, 6 coffee houses, 1 public bath, 192 shops, a high school, and an elementary school [11]. In addition, three government buildings have been built along the newly asphalted Lice-Kulp road north of new Lice. For recreation, the town plans are for a green belt and a sport complex. New Lice is planned for an eventual population of 20,000.

The new houses in Lice are constructed under the auspices of the Ministry of Reconstruction and Resettlement. They have wood-framed, pre-fabricated wall panels of cement board covering a layer of insulation, and either corrugated steel or tile roofs. These houses have been described in detail by Mitchell (1974: Chapters III and V) for the Gediz earthquake of 1970 and by Keightley (1975:77) for the Bingöl disaster of 1971. The Bingöl and Lice earthquakes tested the earthquake resistant homes built along the Lice-Kulp road, after the rockslide several years ago, suffered minimum damage and most remained occupied after the earthquake. Some houses had fallen and cracked plaster, and dislocated roof-tiles, but none had severe structural damage.

Houses in the Lice area, as in many others of Turkey, are made of coblestone, held together with mud mortar, and topped with a flat earth roof which may later support part of another level of houses. Official government buildings are either brick or stone masonry, held together with lime mortar. There were very few reinforced concrete structures in the area before the earthquake.

Although there are stringent government building codes for houses in earthquake areas, they cannot be enforced, so the typical house in the earthquake region invited catastrophe. The cobblestone walls have little shear strength and the heavy earth-covered roofs are not properly connected to the walls. Walls and roofs are almost independent except for the contact exerted by gravity. Consequently, all the houses in old Lice (excluding the *mahalle* of Yenişehir) were totally destroyed.

VILLAGE RECONSTRUCTION

Lice town was the focus of catastrophe, but there was spectacular destruction in many villages. For example, rock falls onto Yamac and complete collapsing of houses in Yünlüce, Kipcak, Karpuzlu, Damar, and Gürbüz clearly reflected the intensity of the earthquake and the poor quality of houses and construction techniques.

A total of 5,555 houses in 188 villages were either completely destroyed or badly damaged. Three thousand seven hundred and eighty-three village homes were moderately damaged, and 4,664 village homes received light damage. A total of 5,805 houses are scheduled for construction (see Table III).

The two prefabricated house factories in Ankara, producing at near maximum capacity, were considered capable of completing 1,500 houses for the Lice restoration by the middle of November. Since far more were needed before winter would begin, the Turkish government decided to import houses from European countries. Thus, there are more different types of structures in the disaster region than observed after any previous disaster. Finland, France (Fig. 3), Germany (Fig. 4), Libya, Switzerland and Yugoslavia (Fig. 5) have exported houses with distinctive characteristics. Seven hundred and four French style houses in 15 villages have been completed; 377 more are scheduled. Seven hundred and ninety-five Yugoslavian styles are planned for 21 villages

TABLE III

Total House Construction for the Lice Disaster Region[1]

District	House Construction Scheduled		Houses Completed	
	Foreign Assisted	Turkish Gov't	Foreign Assisted	Turkish Gov't
DİCLE	736	95	75	1
HANI	0	518	374	304
HAZRO	97	100	0	0
KULP	541	52	129	0
LİCE	1,402	2,264	1,073	1,944
Subtotal	2,776	3,029	1,651	2,249
Total	5,805		3,900 (67%)	

[1] Construction by Turkish Government and Foreign Assisted (as of 1 June 1976). Provided by T.C. Imar ve Iskan Bakanlığı, Bölge Müdürlüğü, Diyarbakır, Turkey (Diyarbakır Regional Director, Ministry of Reconstruction and Resettlement), June, 1976.

but only 335 have been completed. Two hundred and fifty Finnish style houses were built in Hani. Approximately 46 percent of the planned 2,776 houses built with foreign assistance have been completed (see Table III). In addition, several social facilities have been completed.

The new earthquake resistant houses were built to quickly solve a critical housing shortage. New houses went up within days after the disaster. Hasty construction before the winter set in was important. In light of the Gediz experiences, were the reconstructions efforts compatible with the *perceived* as well with real needs of the affected people? This question can be answered by evaluating the new housing characteristics within the traditional framework of eastern Turkish settlements.

The new prefabricated houses in the villages are small single units, widely spaced, and considered by the villagers to be expensive. Although costing the user only between 5,000 and 1,200 dollars, depending on the govern-

Fig. 3. French style prefabricated house.

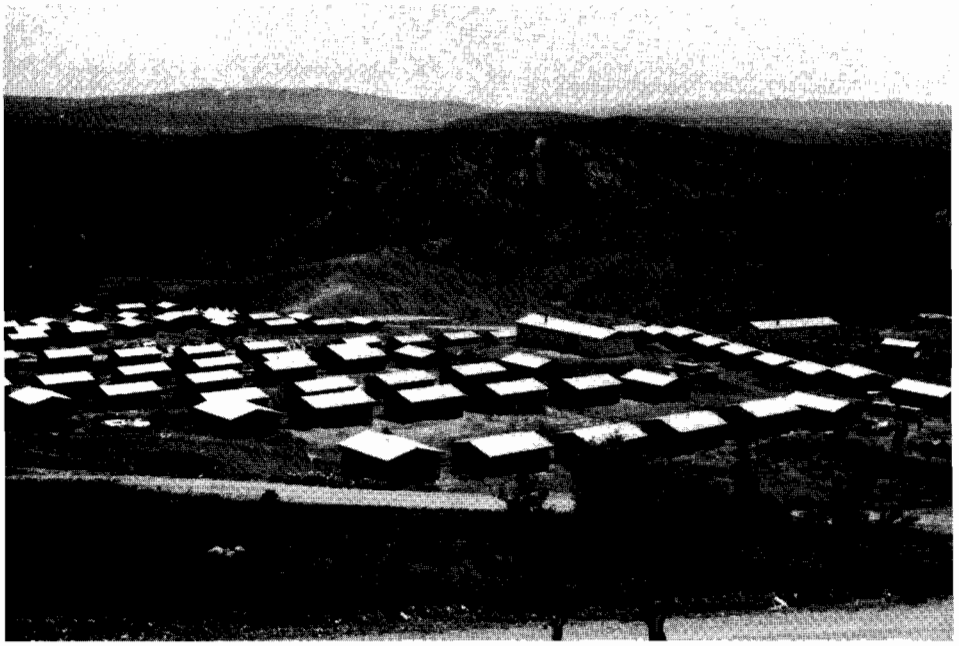

Fig. 4. Settlement of German style houses.

Fig. 5. Settlement of Yugoslavian style houses.

TABLE IV

Foreign Supplied House Types[1]

District	Village	Houses Scheduled	Houses Completed	Country
DİCLE	Yokuşlu	99	75	Yugoslavia
HANİ	City	250	250	Finland
	City	90	50	France
	City	188	60	Yugoslavia
	Gomerç	21	0	Yugoslavia
	Seren	88	14	France
HAZRO	Dadaş	97	–	France
KULP	City	96	–	Yugoslavia
	Karpuzlu	92	–	Yugoslavia
	Gürlük	26	–	Yugoslavia
	Dürü	47	–	Yugoslavia
	Narlıca	122	100	Yugoslavia
	Zeyrek	49	–	Yugoslavia
	Bayır	30	–	Yugoslavia
	Ağaçlı	49	–	Yugoslavia
	Çaglayan	30	0	Yugoslavia
LİCE	Gürbeyli	70	70	France
	Damar	13	13	France
	Tuzla	56	28	France
	Ergin	72	51	France
	Dűrű	135	53	France
	Daralan	122	117	France
	Yazı	32	32	France
	Boyunlu	102	42	France
	Çavundur	46	46	France
	Ariklı	16	16	France
	Çağdaş	50	50	France
	Kumluca	150	140	France
	Guclu	32	32	France
	Yaprak	127	127	Libya
	Yünlüce	50	50	Switzerland
	Kıralan	65	65	Yugoslavia
	Dernek	181	121	Yugoslavia
	Ceper	83	20	Yugoslavia
Totals		2,776	1,651	

[1] Provided by T.C. İmar ve İskan Bakanlığı, Bölge Müdürlüğü, Diyarbakır, Turkey (Diyarbakır Regional Director), Ministry of Reconstruction and Resettlement), June, 1976.

ment's determination of his ability to pay, and even though financed over a 20-year period at low or no interest rate, in this most economically depressed region of Turkey, villagers with annual incomes equivalent to only a few hundred dollars faced a severe financial burden.

The climate in Diyarbakır ranges from extreme heat in the summer (113°F highest recorded) to severely cold winters (−12°F lowest recorded). The traditional houses had thick rocks and earthen walls and roofs which provided adequate insulation from heat and cold. Additionally, the few and small windows, usually high on the walls, contributed to privacy and minimized heat loss. The new Turkish government houses have a few inches of insulation in the wall panels, covered by exterior cement board. Roofs are corrugated sheet steel and glass windows are large (many are two feet by four feet) and numerous (as many as four or five on most styles). The roofs, walls and windows are not as practical as the traditional house type for insulation – but they are more earthquake resistant.

A major inadequacy of the new houses is their lack of animal shelters. In this herding economy of southeastern Turkey, most villagers housed livestock indoors, on the first floor level, during cold weather. The animals were protected from the elements and additionally generated some body heat which helped warm the homes. Villagers are very hesitant to move into a newly constructed settlement unless they are convinced animal shelters will be provided. In the Gediz disaster, many villagers moved out of the new houses (or refused to move in) because there were no animal shelters. I expect the same for Lice.

Yünlüce: A Swiss-Supported Village

Yünlüce village is now very distinctive compared to other restored settlements (Fig. 6). The Swiss Disaster Relief Organization of the Swiss government, in cooperation with the Republic of Turkey, selected Yünlüce for rebuilding as a model "Swiss" village. A Swiss survey team visited the disaster area from 29 September to 4 October 1975 and selected the

Fig. 6. Yünlüce: Swiss style houses.

the new village site, about 600 meters south of the old village. Between 15 October 1975 and 26 November 1975, fourteen Swiss construction engineers, working with Turkish laborers from Yünlüce, completed 50 houses which were immediately occupied.

In June 1976, construction of Yünlüce was almost completed. The new village, with a Swiss and Turkish flag displayed side-by-side at the southwest entrance, contains an elementary school with three grades, a teachers' home, a coffee house, mosque, medical dispensary, six wash houses, and 50 toilets.

The Swiss realized the problems of separating the villager from his animals and are constructing 150 animal shelters. Also, since the village is about 2,000 meters from a reliable water source, a storage facility has been built at the spring site and water is being piped down by gravity flow. Pressure is adequate, since the relief drops 300 feet over the horizontal distance.

The new white colored homes with brown Swiss window shutters and bright green colored sheet steel roofs make a remarkable contrast with the traditional adobe house. Unfortunately, it is doubtful that Yünlüce will have electricity in the foreseeable future. The expenses to the Swiss government for materials, labor, and transportation for the 50 houses was 966,500 Swiss francs [12].

The Germans, who were constructing a school, hospital, and several houses in Kulp, could learn from the Swiss experience. The Germans were very concerned that the finished product be immaculate. For example, tile floors in the kitchens were cleaned and waxed; although houses had already been painted, a second and third coat were planned. General cleaning efforts by the Germans exceeded that observed during the Gediz reconstruction and that of all other observed Lice settlements. The rigorous use of facilities will quickly erase the effects of immaculate cleaning, second and third coats of paint, waxed floors, and highly polished indoor plumbing fixtures. The additional money spent on niceties could be used to furnish the hospital or the school. Or, the money could be used to defray the cost of bringing water into the houses. The houses had plumbing installed, but were not connected to any sewage system or water lines. Based on the Gediz experience, it is unlikely that a majority of the new houses will ever have indoor water.

Yaprak: A Libyan-Supported Village

New Yaprak village is located on the road between Lice and Kulp, about 10 kilometers east of Lice. The Libyan government donated an amount approximately equal to one million U.S. dollars for building the new village of 127 homes. During my visit to Yaprak the homes were almost completed. The uniqueness of this village is that a water shortage tank was built and pipes laid along with the construction of houses. The village is expected to be the first in the region with operating indoor plumbing [13]. One hundred and fifty families were scheduled to move into the village by the end of June 1976.

POLICY IMPLICATIONS

Restoring an earthquake devastated area is an enormous task. There are bound to be problems when outside agencies attempt to restore communities. The government of Turkey is well experienced with the disruptions caused by earthquake disasters, and faces many more earthquake disasters in the future.

Complaints concerning new village houses constructed after the Gediz disaster have been surveyed and reported elsewhere. (Mitchell, 1974: Chapter V). Those suggestions were provided to the appropriate officials, yet because of reasons unknown to me, most of the earlier recommendations concerning physical arrangements of new villages, quality control of construction, indoor plumbing, water, ani-

mal shelters, and glass windows were not implemented. Consequently, as in the Gediz case, research in the Lice disaster area in 1979 or 1980 may reveal that many houses have been abandoned, and that villagers have returned to either their original or other villages.

A basic question concerns the introduction of modern conveniences (high level technology) into the traditional society of the Lice village areas. A somewhat simpler approach (lower level of technology) would probably be more practical and acceptable by the villagers. For example, why include water faucets, sinks, shower stalls, and indoor toilets if there is an extremely low probability that the house will ever have running water? Need houses be wired for electricity in economically depressed regions that have no electrical infrastructure within reasonable proximity? Considering the unavoidable rigorous use of the houses, do village houses need two or three coats of paint? Why are animal shelters not provided? Finally, are new villages physically arranged as the villagers prefer?

As I have suggested in 1974 (Mitchell, 1974: Chapter V) and 1976 (Mitchell, 1976: 312-313), it seems that the cost of the restoration program could be significantly reduced and the effectiveness of the resettlement program improved. One way to do this is to modify the present program to include an objective assessment of each damaged village in terms of short term availability of electricity and water. The Gediz study suggests that construction based on future availability of water and electricity is not realistic. Thus damaged villages that had no electricity and are not relocated close to electrical power lines, could be rebuilt without electrical fixtures and wiring. Since electricity is required to pump water indoors, the new earthquake resistant houses could also omit water faucets, sinks, shower stalls and indoor toilets which seldom ever function because of no water or drainage system. Thousands of new houses have been built since the late 1960's. Small savings from each house unit become significant at this scale of reconstruction. Savings could be reinvested in the construction of village roads.

More emphasis should be placed on restoring traditional homes with improved construction methods to minimize the hazard of horizontal shaking. The Ministry of Reconstruction and Resettlement is making some headway in this direction as evidenced by their rural educational programs on hazard minimization.

Perhaps the most important recommendation is what should now seem obvious to the national government. That is, the villagers must be surveyed and their perceived needs and opinions taken into account. A non-partisan team from the Ministry of Reconstruction and Resettlement could conduct opinion surveys in high risk areas before earthquakes occur, and in settlements affected by past disasters. The goal should be to minimize the dissatisfaction of the villagers. Realizing that allocations for reconstruction are limited in Turkey and other developing countries, the significance of these recommendations will become even greater in the future. The solution seems to lie more in implementation of a program drawing on local labor, local materials, and local cultural needs rather than in importing a Western-style community.

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NOTES

1 This paper is an abbreviated and rewritten version of *The Lice Earthquake in Southeastern Turkey: A Geography of the Disaster,* United States Air Force Academy Technical Report 76-24, December, 1976.

2 For example, the village of Baharlar (Lice District) consisted of Sünzer, Berbik, Süngeran, Hun, Antikan, and Hamzabey *mahalleler* (quarters). The number of houses in each quarter ranged from 3 in Hamzabey to 12 in Sünzer. Total houses numbered 44, and they were scattered over several kilometers.

3 A lengthy report on the Kurds is found in Short and McDermott (1975). It is difficult to obtain an unbiased portrayal of the Kurdish people.

4 "The Lice Earthquake: A Briefing Document", London Technical Group, September 15, 1975, Appendix I, p. 3.

5 Data provided by Diyarbakır Regional Office, Ministry of Reconstruction and Resettlement.

6 Statistics provided by Diyarbakır Regional Office, Ministry of Reconstruction and Resettlement, and observations in Lice.

7 This discussion is based on a variety of sources, including verbal accounts by residents of Gediz and Lice and officials in Ankara, Diyarbakır, Lice, Kutahya and Gediz. Also useful was "Statement by the Turkish Delegation on Earthquake at Lice, Turkey" (1975).

8 The Turkish press began reporting controversial and conflicting stories on the earthquake recovery only days after the disaster. For example, see: *Cumhuriyet* 10 Eylul 1975; *Akşam* 15 Eylul 1975; *Yeni Ortan,* 13 Eylul 1975; and *Milliyet* 10 Kasim 1975. The newspaper *Cumhuriyet,* 1 Kasim 1975 presented plans for the new town of Lice which were criticised in the *Milliyet,* 10 Kasim 1975.

9 This paragraph is based on tentative data provided by the Office of U.S. Foreign Disaster Assistance, Agency for International Development, Department of State, August 12, 1976.

10 This was documented for Caldıran in a recent AID report: *Disaster Relief, Case Report Turkey-Earthquake November 24, 1976.*

11 Interview with the mayor of Lice, 4 June 1976 and *Yeni Lice: 6 Eylul-29 Ekim.* Records of the Imar ve Işkan Bakanlığı, Bölge Müdürlüğü, Diyarbakır, indicate that a total of 1615 homes would be built in Lice, and that all have been completed.

12 Interview in Yünlüce village, June 2, 1976.

13 Interview in Yaprak village, June 6, 1976.

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DISASTER BODY HANDLING

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INTRODUCTION

An analysis of body handling following death is essentially an excursion into a work situation and its activities, actors, and settings. That is, there is a social structure implicit, if not explicit, in the body handling process. It is this social structure which will be the focus of this paper. Given the taboo nature of death in the American culture (Vernon, 1970), the general public and even various professionals are typically "protected" from the post-death activities which are carried out by 'professional body handlers," i.e., morgue attendents, coroners, funeral home personnel, and funeral directors. However, in a disaster situation involving mass casualties it may become necessary to include other actors, i.e., volunteers, in the body handling process. In addition, the activities of the task structure with respect to the bodies are considerably altered in the aftermath of a disaster. The task structure is greatly elaborated and the division of labor becomes much more complex than it would be in a normal death situation.

There are important contrasts between the body handling process, which is carried out by service organization professionals in the normal death setting, and the process carried out by these professional body handlers and the volunteers following a mass casualty disaster (Pine, 1974). The present paper will analyze the social structure of the work situation in the disaster setting, which derives from: the unorthodox disaster death agent, the combination of professional and volunteer body handlers, and the emergence of a new task structure.

Assuming for the moment a dramaturgical model (Goffman, 1959), it is important to compare the stages for body handling. There are some significant contrasts between the normal death and sudden collective death settings. First and most obvious, rather than dealing with one body at a time, the handlers are confronted with a number of bodies, hence a much greater work load. Secondly, as a result of the overload and the need to act expeditiously, it becomes necessary to include actors who are not professional body handlers in service organizations. Third, in a normal death situation the funeral director as a professional body handler typically carries out a "one-person" act in the handling process, seeing it through from start to finish. In the disaster situation, however, a complex division of labor emerges which revolves around detailed task specialization of professionals *and* volunteers. Finally, in a normal death the body handling occurs primarily in one locale after the body has been removed from the place of death. While this may also be the

case following collective death in a disaster, the process is usually dispersed to several locales which reflect the complex division of labor and task specialization. In the disaster setting, therefore a wide array of phenomena converge into a systemic relationship in the form of a *temporary* body handling system with its own unique structure of roles and normative guidelines.

PROCEDURE

The disaster which provided the setting for these observations was a summer flash flood in the Rocky Mountains in the western United States. The water ripped through a twenty-five mile long canyon after more than ten inches of rain had fallen in a four-hour period. Along the canyon overlooking a scenic river, there were numerous summer homes, trailers, tourist motels and hotels, and a small community. Beginning at approximately 8.45 p.m., on the ill-fated night, as it continued to rain, a twelve-foot wall of water came crashing through the canyon catching most people by surprise as there had been no extensive systemic warning. When it was quiet again, one hundred and forty-five people had been killed.

The data on the handling of the dead were collected by a field team which arrived in the area less than a day after the disaster [1]. Direct observation was the major source of information along with interviews with the body handlers. Access to the work areas for body handling was total, except for the embalming process at the funeral homes, and provided a unique opportunity for sociologists to observe activities which are typically guarded and secret behaviors.

The Body Handlers

While the canyon was devastated, a community close to the foot of the canyon was not directly affected by the flash flood, although the land at the edge of the town served as a spill-out area. It was from this community that the primary response came for handling the dead, drawing both professional and volunteer handlers.

In order to adequately highlight the uniqueness of the types and numbers of body handling actors in this mass casualty situation, a brief description of the body handling tasks in a normal death will follow. Typically after a death and the certification of the cause of death, the survivors contact a funeral home of their choice and employ this organization to "make the suitable arrangements". The first step in these arrangements involves the removal of the body from the place of death, generally either a private residence or an institution, by one or two staff members of the funeral home and possibly a morgue attendent of the institution. The body is then taken to the funeral home where the remaining body handling steps are carried out: embalming and presenting (restoring, dressing, casketing, and setting up for visitation) (Pine, 1975). It may be seen that the only people actually dealing directly with the body are professional body handlers in this typical situation.

In marked contrast to this relatively simple social structure for body handling is the mass casualty disaster situation. With sudden collective deaths the body handling personnel must be considerably expanded in number, and by virtue of this and some unique problems, the personnel expanded by type as well. In order to deal with the excessive number of bodies the professional body handlers are assisted by a large number of volunteers. The volunteer body handlers come from various occupational realms with concentrations of three general types, which reflect the recruitment pattern for the body handlers. The first type of volunteer is the professional from medical organizations, e.g., doctors, dentists, nurses, etc., whose general training with respect to the human body is quite valuable. The second major type of volunteer body handler is affiliated with community safety organiza-

tions such as the police department, fire department, or sheriff's office, who may have previously dealt with bodies in accident situations. The final type of volunteer body handler is extremely important in mass casualty disasters which cause considerable disfiguration of the bodies, that is, the identification expert (Pine, 1974; Hershiser and Quarantelli, 1976). These identification experts are drawn from safety organization laboratory staffs, private investigation offices, and public bureaus of investigation.

The Task Structure

The task structure of this protective and secretive behavior, i.e., body handling, varies considerably from the singular body to the multiple body work load. As briefly described in the previous section, the task structure in a normal death setting is relatively simple: certifying the death, storing, removing, embalming, and presenting the dead. The previous research on body handling following mass casualty disasters has not dealt directly with the actual tasks of body handling. The earliest study done in the area by Pine (1969) looked at the spheres of control, and five processes related to body handling in the aftermath of an airplane crash: communication, notification, identification, distribution, and consolation. A later study done by Hershisher and Quarantelli (1976) emphasized the emergent groups following a flash flood which define the tasks and determine the general program of action: a search and recovery group, an identification group, a missing persons group, and a coordinating group. However, no previous study has been undertaken to outline and explore the body handling tasks as the central exigencies of the mass casualty situation. There are certain tasks which "must" be carried out with respect to a body in the American culture. While the task structure for a normal death is relatively simple as defined culturally and by the professional body handlers, it is expanded and considerably more complex following a disaster.

The general tasks of body handling in the mass casualty situation include: search, recovery, transportation, clean-up, identification, embalming or dusting, storage, positive identification, death certification, distribution, and presentation. In addition, most of these tasks may in turn be broken down into various related subtasks. The contrasts between these eleven individually discernible major tasks with the five-step handling in a normal death setting will be elaborated.

The chaos created by a disaster, whether of human error or natural origin, is a significant factor in complicating the body handling process. Due to such factors as the speed, force, and scope of the disaster agent, the bodies of the disaster's casualties may be widely dispersed, separated from identifying objects such as clothing, jewelry, purses/wallets, hidden by debris, and unrecognizable. Due to emotional, legal, and cultural demands the bodies must be found, if at all possible, brought out of the disaster area, taken to a formal body handling staging area, and identified (Gerber, 1974).

In this flash flood the disaster scene was devastated. It was even difficult to clearly determine where homes, cars, or roads had once stood much less to locate a human body. Therefore, search and helicopter crews were sent out to canvas the area and locate the bodies. Even after a body had been sighted and marked on a map for location it was often difficult to "recover" as some were caught on a tree mid-stream or buried in a mud covered car. Recovery was also made difficult by the increased body weight due to bloating in the water, and the fact that motor vehicles could not get into the canyon area. Therefore, the recovery was the task of persons on foot and in helicopters. In several instances search crews had to secure a located body by tying it to a boulder or tree until more help could be brought to the site. If it was at all

possible, identification clues were kept on or with the body. The "interaction" between the body handlers and the bodies during this phase of the process centered around heavy labor and hard work. It was difficult and dangerous for an individual to walk through the area much less to pull a body out of it. Minimal means for protecting these workers from the bodies such as rubber gloves, disinfectant spray, or body bags were available. Due to the limited landing abilities of helicopters the bodies had to be carried to clearings where a helicopter could set down. At this point the body was covered if there was a body bag, a large plastic bag, or a blanket available.

A relay system for the bodies was developed in which a small helicopter which could carry either one or two bodies in addition to the pilot, would transport them and their identification materials to a landing sight. Here the bodies were collected or "stockpiled" until there were enough for a trip by a large helicopter capable of carrying a number of bodies down the canyon to the next staging area, which was a non-public heliport. (Although there were also a number of stranded survivors being evacuated in the first few days from the canyon, they were brought out in separate helicopters and to different heliports.) At the heliport the bodies were taken from the helicopter and placed in the beds of pickup trucks (two or three at a time but in individual body bags) and driven to the garage of a community funeral home. At this staging area the body which had typically been badly battered, exposed, encrusted with dirt and mud, and declothed by the flood waters was cleaned off in order that the first identification information might be collected.

The clean-up involved unloading the body from the truck, and placing it while still in the body bag on a cart. Next the body bag was opened, pulled away, and the body was positioned face up on the cart. Then the body was hosed off with water from a garden-type hose, and long hair was cleared away from the face. And finally, before beginning the collection of identification information, the entire body was sprayed with disinfectant in order to protect the body handlers.

Identification was considered to be extremely important in the legal realm as well as by the family members in order that the death might be perceived as a concrete, "real" event which attained closure in their minds. The actual logging of identification characteristics and materials began at this garage staging area, although protection of identification material was an important subtask in recovery and transportation. Three photographs were taken of the head (one frontal and two profiles); routine physical characteristics such as hair and eye color, height, weight, sex, approximate age, etc., were noted; unusual characteristics such as scars, tatoos, false teeth, pierced ears, etc., were noted; the body was given a number and "toe tagged" with it; property on the body such as rings, earrings, watches, pieces of clothing, false teeth, etc., was removed and marked with the toe tag number; and finally finger prints were made. After all of these identification subtasks had been carried out, the body was covered up and one of the community funeral homes was called to pick it up for embalming. The funeral home at that same location did some of the embalming but the number of bodies involves necessitated calling on others for assistance.

Each funeral home came to pick the body up with their own vehicle and transported one body at a time. The bodies were either partially embalmed, fully embalmed, or dusted with a lime compound if the deterioration was well advanced. On completion of this process the body was then taken by the funeral home staff to the temporary morgue, which had been set up at a hospital building unoccupied at the time of the disaster. The body's numbered identification information preceded it to the temporary morgue by special courier directly from the clean-up area.

The temporary morgue was the primary

holding area or storage site for all the bodies, and in addition to this function the temporary morgue was also the site at which the missing persons list was compiled. Great care was taken to separate spatially the area where the bodies were held from the more public areas. When a body arrived at the temporary morgue it was covered with a sheet. The cart was brought in through the former emergency room entrance, which was guarded by uniformed Sheriff's deputies to keep the public out. The body was then taken to an out-of-the-way room (later to a refrigerated truck). In a separate section of the building the missing persons identification information from survivors was being recorded and matched up with the identification information on the recovered bodies.

Often it was necessary to re-do finger prints at the morgue because the first prints taken at the clean-up staging area were of poor quality, and to call on dental specialists for detailed examinations. When it appeared quite certain that a body's characteristics matched those of a name on the missing persons list, a final review of the body was made by the body handlers. If this review seemed to confirm the match, the body was then removed to a separate room (away from other bodies) and a family member was accompanied for a positive identification. After the positive identification was made the death was certified, i.e., the offical cause of death was matched with the legal name rather than the toe tag number, and the legal documents were filled out.

At this point the family was able to act as they would have in a normal death and contact a funeral home of their choice, which removed the body from the temporary morgue and transported it to the funeral home where it was prepared for presentation. Since embalming had already been completed and the bodies and faces of many bodies were in no condition for viewing, the only subtasks remaining for the body handlers at this stage was casketing and setting up for visitation.

Although the overall task structure with respect to body handling in the disaster situation is quite complex and diversified, it is possible to state that six of the body handling tasks (search, recovery, transportation, clean-up, identification, and positive identification) are all focused on regaining one single element which has been lost in the disaster – body identity. It is the goal of identification which makes disaster body handling unique. Identification is not a requisite which the professional body handlers must deal with in normal death situations. The professional body handlers are ill-prepared to execute the various tasks in the early stages of disaster body handling. In addition, they do not accept these tasks as part of their job, i.e., they are death specialists and death experts who have an image and professional identity to preserve (Pine, 1975). Therefore, these early tasks, i.e., the "dirty work," fall into the hands of volunteer body handlers while the professional body handlers play a much more active part with the later tasks (embalming, storage, death certification, distribution, and presentation) (Pine, 1974). That is, there is a specific division of labor which emerges in the disaster mass casualty situation. At this point, a closer look at the division of labor in disaster body handling will be presented.

DIVISION OF LABOR

The coordination of the body handlers and the tasks of body handling results in a division of labor, i.e., the allocation and assignment of various responsibilities and functions to these workers. Unlike the division of labor in normal death situations which is quite traditional and routine, that of the sudden mass casualty situation is an inter-meshing of the institutionalized and the non-institutionalized as dictated by the settings, the actors, and the tasks. Not only is the disaster situation non-routine but it is physically and socially disrupted, which necessitates the development

of an ad-lib or emergent aspect in human behavior. One important change is that the body handling staging areas are not at the typical institutions and service organizations of death. Instead the settings include heliports, funeral home garages, temporary morgues at former hospitals, etc. In addition, the body handling role incumbents are drawn from various types of actors and not exclusively from the professional body handlers. As discussed earlier, there is also a need for medical professional volunteers, safety personnel volunteers, identification expert volunteers, and miscellaneous volunteers. The third and perhaps most important condition influencing the division of labor is the nature and number of the body handling tasks. The new task structure of the disaster mass casualty situation is greatly expanded and elaborated, as discussed in the previous section of this paper. The result of these changes in the body handling process after a disaster is a complex division of labor. In order to clarify the character of the temporary body handling system in disasters, a general discussion of the task assignment and specialization criteria will precede a specific discussion of the disaster body handling division of labor.

Task Allocation Criteria

There appear to be six criteria which help to determine "who does what" in the body handling process in a disaster setting. Although the task assignment to the professional body handlers is a relatively straightforward carryover from their tasks in a routine death situation, this is not so much the case with the volunteer body handlers. Therefore, various criteria emerge in the disaster setting which help to establish and clarify the division of labor for all body handlers. The criteria which order, i.e., structure, the division of labor in body handling are: legal responsibility, expertise, routineness of the task, availability, body contact, and ecology.

The professional body handlers' roles are most influenced by the first three criteria. For example, the coroner is *legally* obligated to determine the cause of death and subsequently certify the death. While the general cause of death may be quite certain in disasters, e.g., drowning, the death may not be certified until the body's identity is determined. Therefore, the coroner and deputy coroners are linked to the identification and positive identification tasks in at least an indirect sense. Through their role label it is clear that the professional body handlers have the *expertise* for body handling tasks. This expertise for morgue attendents, coroners, and funeral directors is strongly related to specific professional training, knowledge, specialized equipment operation, and experience. By virtue of the legal responsibility and expertise it would be logical to assume that professional body handlers are involved in all of the body handling tasks in a mass casualty situation. This is not the case. In the first place, they do not have adequate time or energy to do so, but secondly and less obviously, the professional body handlers carry out the *tasks which are routine* for them in a normal death situation due to professional attitudes and definition of their "appropriate" role in the body handling process. Therefore, funeral directors have little involvement in the identification tasks and coroners are not involved in embalming, nor is either involved in the search or recovery tasks.

The volunteer body handlers' roles or tasks assignments are shaped by more diverse criteria. In fact all six criteria influence the division of labor among the volunteers. However, finer distinctions may be made for each of the volunteer categories: medical professionals safety personnel, identification experts, and miscellaneous workers. The medical professional volunteers include doctors, nurses, and dentists who facilitate the body handling process primarily through: their *expertise* with respect to the human body and medical record

keeping; their familiarity with body handling, although typically living bodies (*routineness* of of tasks); their *availability* either by their own decision or their employer's; their relative comfort with direct *body contact*; and their familiarity with the floor plans, i.e., *ecology*, of the funeral home's garage, the temporary morgue, etc.

The safety personnel volunteers are drawn from the police department, the fire department, the sheriff's office, the National Guard, and the army. Each of these organizations has a type of *legal* community mandate to protect and uphold citizens' safety and community order. This responsibility was logically extended to the disrupted mass casualty crisis. While their *expertise* is an important criteria in their task assignment, there is considerable variation in the type of expertise these volunteers possessed. For example, contrast an expertise in wilderness safety and survival techniques with laboratory knowledge of finger print-making on a corpse. Safety organizations are *routinely* called upon in accident and crisis situations; e.g., auto accidents, homicides, fires, natural disasters, wars, etc. In many of these crises there is loss of life and the personnel are at least exposed to death if not directly involved in body handling. Also by virtue of their "public servant status" they are more easily made *available* and freed from their routine responsibilities. Either previous experience with *body contact* and/or an attitude that "somebody has to do it" helps to minimize their avoidance of the bodies. And finally, these safety personnel are extensively familiar with the layout of city streets and the location of buildings, which helps in establishing and coordinating the staging areas, i.e., *ecological* knowledge.

The identification expert volunteers include crime laboratory specialists, private investigators, public investigators, and a physical anthropologist. While some of these experts have an indirect *legal responsibility* to assist with the body indentification, others were truly volunteers. Their *expertise* in body identification is reflected in extensive training, sophisticated knowledge on the subject, and technical abilities and skills. These are also people who are *routinely* called upon for body identification following suicides, homicides, and accidents. While the above three criteria are the most important in determining the involvement and the task assignment of this category of volunteers, their *availability* through being relieved of everyday jobs and their past experience with human *body contact* and handling are secondarily important criteria.

Finally, there are those volunteers who may not be characterized in any but an individualistic fashion and have therefore been labeled as miscellaneous volunteers. These volunteers are private helicopter pilots, spouses of other body handling volunteers, mental health workers, and clergy. The task assignment criteria for these volunteers are: the helicopter pilots translate their *routine* skills into a needed function in the disaster situation; the spouses of other body handlers have the time for the work, i.e., *availability;* and the clergy and mental health workers are either relieved or relieve themselves of their daily responsibilities in order to be *available* to assist in this crisis.

Overview

At this point the overall division of labor for the body handling process, which matches the body handlers with the body handling tasks, will be specified in Table I. Several important characteristics about the body handling division of labor may be derived from this table. The complex division of labor reflected reveals surprisingly little task responsibility overlap between the professional and the the volunteer body handlers. In fact, of the eleven body handling tasks only two involved both general types of body handlers (identification information gathering and the final

TABLE I

Body Handling Division of Labor in Disasters

Body Handlers					
Task Structure	Professionals		Volunteers		
	Professional body handlers	Med. prof. volunteers	Safety personnel vols.	I.D. expert volunteers	Misc. volunteers
Search			X		
Recovery			X		
Transportation			X		X
Clean-up			X		
I.D.	X	X	X	X	X
Embalming*	X				
Storage*		X	X		
Positive I.D.*	X	X		X	X
Death Cert.*	X				
Distribution*	X				
Presentation*	X				

* Tasks in normal death situations; i.e., professional body handlers' tasks

positive identification). Secondly, it may also be immediately noted that the volunteer body handlers' work is concentrated in the early stages of the process while the professional body handlers focus on the later stages. Third, among the volunteers, the safety personnel are the most important as seen by their dominance in all but one of the non-professional body handling tasks. Fourth, looking at the tasks it appears that a great deal of emphasis is placed on body identification. In fact, all five types of body handlers are assigned to identification subtasks.

In Table II a more specific illustration of the division of labor is given. In place of the general categories of body handlers their specific titles have been substituted. The diversity in the titles is immediately apparent (over fifteen different titles appear), which is an indication of the complexity with respect to coordinating the body handling personnel. Among the volunteer body handlers the Sheriff's Office had the dominating influence and presence as seen in this table. It is important to note that while the local safety personnel have proximity to the disaster scene, and most of the body handling staging areas are within their jurisdiction, the county-level safety personnel, i.e., the Sheriff's Office, are legally responsible since the disaster occurred in the county rather than in the assisting community.

Among the professional body handlers the funeral directors and the coroner's office are of equal dominance, and maintain their routine division of labor with respect to the body handling tasks. There is only one slight exception to this which occurred when one funeral director assumed the task of delivering the numbered identification information and property to the temporary morgue from the clean-up staging area. Therefore, there are noteworthy carry-overs in the assignment and assumption of responsibilities from routine obligations of the personnel (volunteer and professional) to disaster requisites in the body handling arena.

TABLE II

Body Handlers and Tasks

Task structure	Specific types of body handlers
Search	Sheriff's search and rescue group Civilian search and rescue group National Guard
Recovery	Sheriff's search and rescue group Civilian search and rescue group National Guard
Transportation	Army Private helicopter companies Fire department
Clean-up	Sheriff's laboratory staff Spouses of other volunteers
I.D.	State Bureau of Investigation Federal Bureau of Investigation Dentists Sheriff's laboratory staff Private investigators Funeral Directors*
Embalming	Funeral Directors*
Storage	Coroner and Deputy Coroners* Doctors Nurses Police Department
Positive I.D.	Mental health workers Survivors and families Coroner and Deputy Coroners*
Death Certification	Coroner and Deputy Coroners*
Distribution	Survivors and families Funeral Directors*
Presentation	Funeral Directors*

* Professional body handlers

CONCLUSIONS

The body handling process following a mass casualty disaster is effectively organized and executed by all body handlers – both professional and volunteers. However, it has been demonstrated that there are distinct differences between the two types of workers. In general this contrast is based upon the "routine" nature of the body handling tasks for the professional body handlers versus the "emergent" nature of the body handling tasks for the volunteer body handlers. This contrast is reflected in their recruitment patterns, previous work experience, division of labor and work styles.

In a mass casualty situation professional body handlers are immediately called upon for assistance as public servants rather than as small business persons who have been contacted by the families of the deceased. Their routine work and exposure to death make them logical candidates for this work. However, in disasters there are a number of body handling tasks which the professionals are not only ill-trained and ill-equipped to do, but are also reticent to associate with. Their reticence has its source in both a work overload due to the number of bodies and a hesitancy to stigmatize themselves with a great deal of "dirty work" or an image of body "chasing". Therefore, additional body handlers are sought from medical, safety, and identification organizations. These volunteers are recruited due to the relative "goodness-of-fit" between their everyday occupations and the body handling tasks.

Although the professional body handlers retain their traditional reference groups which have a controlling influence on the standards of their body handling work, the volunteer body handlers must situationally determine who their "significant others" or their reference groups will be for this work. Therefore, while the professionals adhere to the standards of the National Funeral Directors Association, those of "the public," etc., the volunteers, look to more direct sources of guidance: the professional body handlers, other volunteers, and superiors from their own organizations.

In the division of labor rather striking contrasts are seen between the professionals and the volunteers. The professional body

handlers by virtue of their expertise and comfort with body handling are able to carry out very complex tasks, e.g., embalming, while the volunteer body handlers at all stages of the process deal with simplified tasks created through minute specialization and task segmentation. In the overall division of labor it is most noteworthy that the professional body handlers exercise considerable control over the body handling process as they retain the tasks to which they are accustomed and delegate the alien tasks to the volunteers.

Body handling is analyzed through the institutionalized and non-institutionalized means utilized. The professional body handlers' work style is focused on the retention of their institutionalized means, e.g., one body at a time in vehicles, one embalming completed before another is begun, low public profile, deal with individual families for arrangements, emphasize individuality of the arrangements, etc. That is, their "style" reflects a concern with deliberateness and their professional image. On the other hand, as newcomers to body handling the volunteers seek means to complete their work which "gets the job done," makes them as comfortable with the work as possible, and – relating the two prior criteria – quickens the completion of the tasks. In general, the non-institutionalized means of the volunteer body handlers, e.g., transporting in pickup trucks, cleaning with water hoses, referring to the body as "it" rather than as him or her, the "death dance" etc., reflect a concern with maximizing their social distance from the work. Most important, however, is the blending together of the institutionalized means of the professional body handlers and the non-institutionalized means of the volunteer body handlers into a temporary system, which effectively responds to the body handling problems in the mass casualty disaster.

POSTSCRIPT

The description and analysis set forth comes from a single case study in one society. The extent to which the described pattern of handling the dead prevails, will of course have to be established by a range of studies of many kinds of mass emergencies in various social systems. Other societies with different attitudes towards the dead and different everyday activities with regard to processing dead bodies, may very well show major differences in their handling of the dead in mass disasters. But until more research of the kind just presented in this paper is undertaken, there are not even rough guidelines on what should be examined. This paper suggests some such guidelines for future cross-cultural studies, as well as indicating the probable American pattern of body handling in mass disasters.

NOTES

1 The team was in the area primarily for other research purposes, but the author focused specifically on the handling of the dead in the situation. The help of Marti Worth in gathering the field data is gratefully acknowledged.

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A REVIEW ESSAY ON PANEL ON THE PUBLIC POLICY IMPLICATIONS OF EARTHQUAKE PREDICTION, *EARTHQUAKE PREDICTION AND PUBLIC POLICY* (Washington, D.C.: National Academy of Sciences, 1975), 142 pp., $ 6.50

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What is the first thing you should do if you were a mayor who had just been notified by the governor that your city was in an area in which there was a fifty percent probability of a Richter magnitude 7 earthquake occurring between Labor Day and Christmas of 1983? If you answered: "Sit down and read the National Academy of Sciences' report on *Earthquake Prediction and Public Policy* from cover to cover," then give yourself fifteen bonus points and proceed.

Prospects that in the not-too-distant future earth scientists will be able to forecast the time and location of damaging earthquakes (those above Richter magnitude 6) seems like a rather innocuous if not welcome development. It may come as a surprise therefore to learn that there are individuals who say "In vulgar language, we need an earthquake-predicting facility like we need a hole in the head" (Hardin, 1973: 133). Other groups such as the California Business Properties Association are more subtle in their expressions of concern but make the point rather firmly that this new technology threatens some deeply-held interests (Cook, 1975). What's going on here?

Earthquake predictions are unique and worrisome because they are likely to differ in several ways from warning-and-response processes associated with other types of natural hazards. For instance, those tell-tale changes called "premonitory signs" which indicate the beginning of a causal chain eventually culminating in the occurrence of an earthquake may occur *decades* before impact rather than a few hours or days as in the case of tornadoes, floods, hurricanes, and the like. Will this mean that information about the prediction will enter into decisions to buy or sell a house, to locate a business, or to market insurance in ways that the threat of other hazards does not? The so-called "time window," that period in which a predicted quake is expected to occur, will likely range from a matter of a few weeks for smaller magnitude earthquakes to a year or more for larger ones. Should cities be evacuated until the time window has passed? Or should schools be closed at least? There is an additional factor complicating the earthquake hazard for, unlike most other natural disaster agents, evidence that one is on the way (or that conditions were right for one that did not occur) will be evident only to a handful of individuals in the scientific community. Generally visible precursors such as rain before a flood or green skies and hail before a tornado will be absent. And a final twist to the plot adds a further dash of uncertainty. The infrequency of the very largest quakes (e.g., those of Richter

magnitude 8 or greater) means not only that they are difficult to study but also that any prediction of a major earthquake will likely be the first for a given community which therefore will have no reservoir of similar prediction experiences to draw from.

Recognizing the unique and serious nature of issues surrounding this new technology of earthquake prediction, the National Academy of Sciences moved on two fronts in the early 1970's to address the topic. Its Committee on Seismology organized the Panel on Earthquake Prediction to evaluate the current physical science state-of-the-art of predicting earthquakes and to assess the prospects for development of this technology in the near future. (Findings and recommendations from this Panel will not be described here; see Panel on Earthquake Prediction, 1976.) The Panel on the Public Policy Implications of Earthquake Prediction was organized in the spring of 1974 under auspices of the Academy's Advisory Committee on Emergency Planning. Chaired by Ralph H. Turner, sociologist from the University of California at Los Angeles and a member of the Advisory Committee, the Panel consisted of eight members assisted by thirteen liaison representatives and three consultants and represented a variety of academic disciplines (sociology, political science, economics, law, and seismology) as well as earthquake engineering, disaster preparedness and relief agencies, and the private sector. With initial funds from the Federal Disaster Assistance Administration (Department of Housing and Urban Development), the Panel sought to identify social, economic, legal, and political issues surrounding the implementation of this new earthquake prediction capability which might be the basis for both the formulation of public policy and for recommendations for future policy-relevant social science research. Its final report, *Earthquake Prediction and Public Policy*, is thus addressed not only to an audience of local, state, and Federal governmental officials but also to individuals from the business and private sectors, social scientists and researchers, and interested citizens in general.

With such serious issues and questions surrounding its use as those mentioned above, one might well ask: Is earthquake prediction a good thing? The Panel responds in several ways. First, earthquake prediction is inevitable. Given the nature of science and of scientific work in the United States, suppression of earthquake prediction research would not only be objectionable but unsuccessful as well. The only consequence might be to delay its development (pp. 31–33). Hence this question is of secondary importance if not irrelevant. Second, ability to predict earthquakes clearly offers the opportunity to save lives and reduce physical injury, although prospects for reducing property loss due to earthquakes are less certain (pp. 3, 119). But third, appropriate action by public officials at local, state, and Federal levels together with business, financial, and labor leaders now and as the forecasting technology develops can forestall or at least lessen the feared economic and social costs of predictions (p. iv; see also pp. 119, 138).

The scope and something of the substance of the Panel's report is exposed by describing its handling of three topics central to any discussion of the use of a routine earthquake prediction capability. (An excellent condensation of the report, including all its policy and research recommendations, appeared in an earlier number of this journal; see Turner, 1976a.) First, the earthquake hazard is at base a problem of hazardous man-made structures. That is, the primary threat to human safety in earthquakes arises from the failure of buildings (p. 36), with secondary threats posed by damage to lifelines such as dams, bridges, and gas transmission lines (p. 37). The real villain of the piece though is the multi-unit building of unreinforced masonry construction (p. 39); what to do about such structures and their occupants when a future earthquake is expected is a question running through several chapters of the report. The State of California adopted seismic-resistant building regulations after the 1933 Long Beach earthquake, and new construction since that time places that

state ahead of others in the East and the Midwest in terms of building safety, but still there are an estimated 40,000 unreinforced masonry buildings in Los Angeles County alone (p. 38). The scope of the hazard broadens when one realizes that earthquakes are not just a California problem, jokes about the San Andreas Fault and ocean-front property in Nevada to the contrary; only eight percent of the population of the United States is not exposed to the threat of earthquakes (p. 20). In fact, such major population centers as Charleston, S.C., the St. Louis-Memphis area, Boston, Salt Lake City, and the Puget Sound region are all significantly exposed to the earthquake threat. Earthquake prediction, therefore, is a potentially significant development for the nation as a whole, not just California although the capability for routine prediction will likely emerge there first (due to the frequency of small earthquakes for study and the relative density of current instrumentation; pp. 25–26).

Without mentioning the sometimes passionate debate between those who argue that the most appropriate attack on the earthquake problem is through engineering, building code enactment and enforcement, and land use planning and those who argue the merits of earthquake prediction, the Panel makes its position clear: "[p]rediction should be used in conjunction with a complete program of earthquake-hazard reduction, and not as a substitute for any of the procedures in current use" (Recommendation 2, p. 4) and "[p]rediction capability does not lessen the importance of other approaches to earthquake mitigation" (p. 24). Once a prediction has been issued, however, the Panel identifies several types of constraints on the choice among mitigation strategies and their implementation. An obvious one is the amount of time between the issuance of the first prediction and the beginning of the time window in which the quake is expected to occur. Consequently the Panel is careful to distinguish between steps to be taken with one or more years of advance warning from those available with less than one year lead time (see especially the final chapter, pp. 120–137). Even with sufficient time, however, very real constraints will come into play in dealing with the problem of hazardous buildings. A careful assessment of laws regarding property rights suggests the general conclusion that government's ability to deal with existing structures is limited (pp. 85–92). In addition, the costs of a massive building safety campaign are likely to be beyond the means of most local and even state governments (p. 111). Furthermore, systematic review of existing studies of evacuation in natural disasters and wartime suggests that use of this strategy on a massive scale is politically untenable (pp. 112–113) and otherwise extremely costly as well (pp. 131–134). Based upon these evaluations, the Panel urges allocation of Federal emergency funds such as provided under Public Law 93-288 *before* the onset of an earthquake to help overcome local economic hardships resulting from the prediction (see Recommendations 5 and 15, p. 7 and pp. 14–15). And it recommends selective evacuation and systematic vacating of unsafe structures since the limitations on other strategies will mean that many of these will remain.

A second topic indicative of the scope of the Panel's concerns is "how to release earthquake predictions and warnings in such a way that the response will be constructive and not counterproductive" (p. 47). One thing the Panel absolutely insists upon is the early and widespread dissemination of any prediction to prevent those with "inside information" from benefiting at the expense of others (p. 77; see also Recommendation 7, p. 9). Public officials should not be afraid to release such information if they fear it will cause widespread panic since there is abundant evidence from over twenty-five years of disaster research that such fears are unfounded (p. 48). Furthermore, scientists issuing an earthquake prediction and public officials issuing a warning are very unlikely to be held legally liable when both are

acting in good faith even if a prediction were to prove erroneous; the same may not be true if scientifically credible information is withheld, however (pp. 81–85). This legal assessment is especially germane since officials are instructed to assume that "occasional disruptive and expensive false alarms are unavoidable" and that "some major or moderate earthquakes may occur without advance notice" (p. 30).

If public officials and scientists need not worry about widespread general panic, the Panel's careful examination of the disaster warning-and-response literature suggests that they should be concerned about citizens tending to ignore the warning altogether, i.e., "to disbelieve the prediction, minimize the danger, and view the situation optimistically" (p. 50). Furthermore, the report suggests that the greatest single difficulty in the warning process will come in prompting appropriate responses from those outside the mainstream of the community such as the elderly, the handicapped, low income populations, tourists, and members of various ethnic and minority groups (p. 52). Placing such peripheral segments of the community on center stage is one of the impressive aspects of the Panel's report; it especially worries about the unequal distribution of the costs of earthquake prediction (physical, social, and economic) which might be disproportionately borne by such relatively powerless groups (see below).

A third topic receiving extended attention is that of dealing with the economic costs of a prediction at the local (or regional) level. What the exact nature of a region's economic reaction will be when the earliest earthquake predictions are forecast with some degree of credibility is far from clear at this point (p. 70), but reading between the lines of the report it appears that one of the keys will be the reaction of non-local businesses, those whose sales are not exclusively tied to local income and employment conditions (p. 72; see also pp. 100–101). There appear to be inevitable costs to the economy of the affected region, but their extent can be altered by Federal policies regarding insurance and emergency aid for the pre-impact period since banks, lending agencies, and insurance companies at the regional level react to such policies (see pp. 72–77).

As earlier when considering personal safety, here regarding economic impact the Panel squarely addresses the issue of the possible uneven burden of costs. One sure way to see that costs will be inequitably distributed would be to allow profit-seeking speculators access to prior information about the prediction (pp. 77–78, 98–99); hence, a relatively simple way to make it more difficult for some to benefit at the expense of others is to insure that all information regarding the prediction is quickly and completely released. Of course, communities are highly differentiated rather than monolithic social constructions; some groups (e.g., the illiterate, tourists, foreign-speaking, the isolated, the hearing-impaired) will be harder to warn than others, some are more likely than others to be living in the most vulnerable structures (e.g., the poor, the elderly, minorities), and some will have greater difficulty recovering from the effects of any catastrophe than others (e.g., the infirm, the aged). The Panel devotes a separate chapter to these issues (pp. 96–104) and notes a hidden danger which might arise from unintended consequences of the most well-intended hazard mitigation programs (pp. 103–104). It urges that programs for offsetting inequities which might surface be designed so that they do not paradoxically provide incentives for maintaining the status quo or even increasing the inequitable exposure to risk (e.g., land use and building code ordinances which drive up the cost of housing and force low-income families in greater numbers into vulnerable multi-unit buildings).

There seem to be two major ways to evaluate a report such as this. One is to examine its relevance in the implementation of the new technology of predicting earthquakes. The

accuracy of the report in anticipating patterns of response to early earthquake predictions and the extent to which suggestions from the report are taken into account are two contemporary indicators of the report's relevance, although its ultimate impact cannot be assessed until the new technology has been in place for several years. A second is to compare the report with others on the same topic or with other hypothetical reports which could have been written. Both will be utilized in the space which remains.

Many of the Panel's projections have already proven to be accurate, and some of its fears also seem well founded. Soon after a university scientist publicly issued what many interpreted as an earthquake prediction (he himself called it an "hypothesis test"), one Los Angeles City Council member instructed the City Attorney to file suit against the scientist and his university for adversely affecting property values in the forecasted area. (No legal action was taken by the city.) Subsequently the State of California passed an earthquake prediction liability bill in an effort to protect those involved in the prediction and warning process (S.B. 1950, 1976; see Recommendation 7, p. 9 and pp. 81–85). The same forecast (officially labeled an "area of intense study") was followed by unconfirmed reports that the three largest sellers of homeowners' insurance temporarily suspended sales of new earthquake policies and riders on existing policies for homes in the area (see pp. 74–76). More recently, a Los Angeles City Council ordinance to require improving hazardous buildings or tearing them down was withdrawn to committee in the face of highly visible opposition from business interests and minority tenants. A second ordinance was approved, calling instead for an inventory of the exact number of such hazardous structures, suggesting that the Panel's identification of the importance of grassroots political support for hazard mitigation programs is highly appropriate in the post-prediction situation (see pp. 114–115, 109–110).

Actually, evidence that the report was to have an impact was at hand even before it had been published. In a six-page cover story on earthquake prediction, *Time* magazine (1975: 36–41; see p. 41) reviewed the principal conclusions of the Panel apparently from a draft of the final report. Other evidence of the report's impact comes from the State of California's Earthquake Prediction Evaluation Council which, both in its deliberations and in the formulation of formal guidelines and procedures (Office of Emergency Services, 1977), has incorporated several implicit and explicit suggestions of the Panel. And there has been at least one effort to clarify existing Federal legislation regarding the use of disaster relief funds before an earthquake but after a prediction. Following disclosure of an "earthquake prediction hypothesis test" (see above), the City of San Fernando, California which was located in the center of the area where a quake would have been expected, requested clarification "of any existing programs in the area of preparedness, with primary concern being directed towards the area of preparedness prompted by the emergence of earthquake (sic) prediction as a factor" (Harris, 1976). The issue, however, remains essentially unresolved for, as the director of the Federal Disaster Assistance Administration notes in his response, the situation is not one in which an official earthquake prediction has been issued and thus "preventive action today must be against a general threat of earthquake rather than against one predicted to occur at a specific location and time" (Dunn, 1976). Most recently, the City of Los Angeles established a twenty-five member Mayor's Task Force on Earthquake Prediction to recommend ways for the city to respond to a future scientifically validated earthquake prediction (Turner is a member of the Task Force).

On other fronts, events have gone generally as the Panel might have wished them, but it is difficult to demonstrate that this is a direct result of the report itself. For example, two major earthquake prediction bills, one in the

Congress (see S. 126) and one in the California State Senate (S.B. 135), each have emphasized development of operational earthquake predicting systems as well as earthquake prediction research, but the Panel recommended that "At the present stage in the development of prediction, a higher priority should still be placed on research into earthquake prediction than on the establishment of operational systems for prediction" (p. 3). In fact, earlier versions of both bills were defeated largely on grounds that development of such operational systems was premature (see, for example, U.S. Congress, 1976: pp. 38–41). Although the Panel recommends formation of Federal-level group of experts to evaluate predictions outside of any agency with its own earthquake prediction mission (Recommendation 8, pp. 9–10), the Geological Survey thus far has been the only agency to form such a body both to review prediction evidence from USGS scientists and to "look at predictions by non-survey scientists on request by a State or Federal official" (U.S. Department of the Interior, 1976a, 1976b). (Also, compare language proposed in its guidelines, U.S. Department of the Interior, 1977: 19294-19295 with that in the Panel's report, pp. 64–65.)

There have also been some developments regarding policy-relevant research recommended by the Panel. Chief among these has been the establishment of a Committee on the Socioeconomic Effects of Earthquake Prediction within the Commission on Sociotechnical Systems of the National Academy of Sciences to spell out in more detail appropriate methodologies and hypotheses for the fourteen general research recommendations in the Panel's report. This Committee has expanded upon recommendations for establishing a standby anticipatory research capability and data needs in the area of baseline socioeconomic data on communities, for studies of legal problems, governmental responsibilities, and intergovernmental relations, and for a variety of responses to predictions by markets, corporations, and families all largely informed by an information processing framework (see the Committee's forthcoming report which will appear in 1978).

Several of the Panel's research recommendations have already been incorporated into a research project directed by Turner himself, in particular those concerned with the dynamics of credibility of predictions and with popular perceptions of earthquake prediction information in survey research being done in the Los Angeles metropolitan area (Research Recommendations 2, 6, and 8; see Turner, 1976c). And inquiry into the experience of other nations with earthquake predictions (Research Recommendation 3) has begun, first within the previously-funded research by Haas and Mileti (1976) and later in Turner's personal visit to the People's Republic of China as part of a scientific exchange delegation in June 1976 (see Turner, 1976b).

The second method of evaluating this report is to compare it with others which have been prepared on the same topic. There have been three other assessments of the issues and concerns likely to surround implementation of this new capacity for routinely forecasting earthquakes, and the Panel's report fares very well indeed in comparison with them. Jones and Jones (1975) develop several "action options" from three prediction scenarios varying primarily in length of lead time, severity of predicted quake, and length of operating experience of the prediction system. While the evolutionary nature of the three models taken as a whole does provide a developmental flavor to the implementation of a new technology generally absent from the Panel's report, the latter has a much firmer empirical base, is much more precise in its identification of problem areas, and is much more sophisticated and detailed in its suggestions and policy recommendations. Identical comments could equally describe the comparison of the report of a technology assessment by the Stanford Re-

search Institute (Weisbecker et al., 1977) which additionally has more of the flavor of a shopping list of things to be considered in developing policies around the new technology.

Only the empirical assessment by Haas and Mileti (1976) has had and likely will have in the future an impact at least in the public policy realm approaching that of the Panel's report. Haas and Mileti drew a purposive sample of several dozen public and private organizations and a random sample of 246 families in various sections of California and presented representatives of each with two scenarios of earthquake predictions. Respondents were asked what his or her group would likely do under conditions described in the scenarios. Data were then used to formulate predictive hypotheses of the likely consequences of future earthquake predictions. Many practitioners, particularly those in California, seem especially impressed by the picture painted by the Haas-Mileti study despite the "What would you do if ...?" character underlying the results apparently because these were drawn from original data rather than by inference from research on other problems. On balance, however, the findings from this projective approach and those of the Panel based upon inferences from previous disaster studies and research on slowly developing social problems are similar, and each report touches on many of the same policy issues as key to the outcome of the implementation process.

Compared with other reports which could have been written, this one also fares very well. Some practitioners have complained that the Panel's report is too superficial, that it does not go far enough. What many seem to be saying is that the report is long on identifying potential trouble spots but short on identifying solutions to them. But members of the Panel would probably respond that this is the first step and proof that they have accomplished their work successfully, that solutions will depend on further developments, on the specific histories of predictions in a particular community, and on the outcome of policy-relevant research such as that proposed in the report itself. This criticism seems to reflect, in other words, a misunderstanding of how best to use the report as well as left-handed proof that the Panel has done its job well.

Another more substantive criticism has come from some members of the scientific community who see many of the Panel's conclusions and suggestions as biased by the type of assumptions made about the nature of earthquake predictions when they are first made, especially regarding the length of lead time available. But this point is well taken only to a degree. The Panel does consider both long lead times (more than a year) and short lead times (less than one year), but does not consider lead times of only a matter of days, probably because this very short period of forewarning would place earthquake forecasts squarely within the confines of other types of natural hazard warnings about which a great deal is known, hence minimizing or eliminating several of the unique features making earthquake predictions and warnings an issue of policy concern (see above). Additionally, the Panel had access to preliminary findings from the earlier Panel on Earthquake Prediction (1976) from which presumably came the model of earthquake predictions used in the report (pp. 26–31). This type of criticism from earth scientists is inevitable since there is no consensus over the exact nature of routine predicting when it develops (p. 25) nor for that matter is there total consensus among scientists that the goal of earthquake prediction will ever be successfully achieved.

It might sound like a "cheap shot" to criticize such a report as this for not considering all the complexities involved in such a complicated matter since obviously some simplification was necessary if any document was to be produced at all. But there is one area where the report could have been usefully strengthened which would have been especially relevant to practitioners and policy makers. At various

points the Panel notes that experiences with later predictions will differ from experiences with the first ones (e.g., p. iv), but, like the Haas-Mileti project, attention probably unavoidably centers on what happens after scientifically valid predictions become available as well as what to do now to prepare for that day without addressing the question of what to do in the meantime. (The Panel does not assume that the first predictions will be automatically or self-evidently credible; see Research Recommendations 6 and 8, p. 12). The interim period (that is, the present and near future) is the gray area, the period of in-betweens filled with "areas of intense study," "earthquake prediction hypothesis tests," and the predictions of prophets, seers, and amateur scientists (see p. 30) which are, if not everyday occurrences, at least rather frequent especially in California. (One interesting prediction by a witch which was partially supported by a university scientist has been recorded in North Carolina; Mileti, 1977.) Many officials have difficulty in sorting through all of this, in deciding what to tell concerned citizens, and in deciding on appropriate courses of action for their jurisdictions.

Earthquake Prediction and Public Policy is an impressive document in all respects. Perhaps the highest compliment which can be paid is that it both does not read like the product of a committee while at the same time it reflects the pooling of concentrated work by some of the most competent people in their respective fields. That the report exists at all can in part be attributed to the National Academy of Sciences which provided additional funds for staff support and for publication after support from FDAA expired before completion. That the report has the high quality, both stylistically and substantively, can be attributed to laborious efforts by the Panel's chairperson, Ralph Turner, and by its executive secretary, Charles Fritz. Several members of the Panel and liaison group have commented especially on the contributions of Turner to each of the sessions when the Panel met and to the manuscript which was ultimately published. The document is commonly referred to as "the Turner report," a shorthand designation which, without slighting the contributions of others in any way (see Turner, 1976a: 202, footnote 1), seems highly appropriate.

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