

MENTAL HEALTH ASPECTS OF DISASTERS

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NATURAL HAZARDS RESEARCH
APPLICATIONS WORKSHOP 1980

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In my comments here today I especially wish to focus upon key epidemiologic concerns which are relevant to the scientific assessment of the mental health effects of major disasters. The discussion will primarily relate to recent major American natural and manmade or technological disasters. Occasional reference will also be made to major events which have occurred in the past in the United States and in a few other developed countries.

THE DISASTER/MENTAL HEALTH RESEARCH FIELD

The disaster/mental health research field is very new as you all know and still in the formative stage of development. Before the 1970's, scattered reports can be found in the published literature which, to some extent, consider what mental health problems disaster victims may experience immediately after disaster impact and over the short-term recovery period.

Reviews on manmade disasters in the past which were associated with war-related events, including prisoner-of-war camps and concentration camps, have demonstrated fairly conclusively that such events are associated with significant short-term and long-term mental and physical health problems (1,2). However, most researchers view these disasters as inherently different phenomena than the major natural disasters which affect communities. For example, Frederick has recently pointed out some key differences between crises in war and natural disasters (3). It is difficult, therefore, to draw any inferences about the mental health effects stemming from war-related events to communities struck by natural disasters. However, technological disasters frequently do affect communities and it should now be possible to employ a common approach to assessing the mental health sequelae following modern-day disasters, either natural or technological.

Recent technological disasters of which you are all aware include the nuclear energy accident at Three-Mile Island in 1979 and the toxic waste emergency in the Love Canal community. Love Canal, referred to as a "Public Health Time Bomb" by the New York State Department of Health (4), was declared a Federal emergency in 1978 and again in 1980. However, even prior to these two incidents various technological disasters have affected American communities such as the 1948 air pollution incident in Donora, Pennsylvania, which resulted in the death of at least 17 people and caused 5,000 of the 13,000 town residents to become ill.

In the United States, there were 326 Federal "major" disaster declarations during the period January 1, 1971 to June 3, 1980, and, of these, 207 occurred in the years 1972-1976. Although not quite as dramatic as the declared major disasters, it is also interesting to note that there were 80 Federal "emergency" disaster declarations during the period beginning July 22, 1974 to June 3, 1980. Major disaster declarations are especially relevant to the general topic on disasters and mental health since, under Section 413 of the Disaster Relief Act of 1974, the National Institute of Mental Health, in cooperation with the Federal Emergency Management Agency, is authorized to provide assistance to victims of major disasters to alleviate disaster-related mental health problems.

From a public health point of view, mortality directly attributable to disaster impact has traditionally been, and, of course, will continue to be, a critical concern of health professionals involved with disaster management and mitigation. With better alerting and evacuation procedures in the future, however, disaster research should continue to focus on short-term and long-term morbidity and mortality which is "secondarily" related to disaster impact. In the mental health domain, the latter type of mortality corresponds to

suicide over both the short-term and the long-term although other end points such as mortality due to cardiovascular complications, fatal accidents, and possibly cancer are potential indicators of stress-related mortality and, thus, may overlap with the mental health domain.

AN APPROPRIATE DISASTER-STRESS-ILLNESS MODEL

For the purposes of this presentation, I wish to adopt the definition of disaster used by Kinston and Rosser (1) in their review of the effects of disaster on mental and physical state, that is, a disaster is a "situation of massive collective stress." In an upcoming report with Melick and Struening dealing with the effects of the Hurricane Agnes Flood on the health and mental health of disaster victims, we suggest that a disaster-stress-illness model could be applied to a major natural disaster such as the Agnes Flood (Slide 1). With very slight modification, the model may also be applied to certain technological disasters which affect communities.

Very briefly, the model begins with the initial disaster impact or initial stressor. Following impact, the series of events which occur during the recovery period may give rise to an even greater stressor or a perceived second disaster. The stressors may in turn give rise to a somatic stress situation for a given individual which, finally, may or may not result in some manifest mental or physical disorder. In addition to the independent variables, or stressors, and dependent variables, or health outcomes, a series of mediating variables should be considered which may modify in positive or negative ways the effects of the stressors on overall health.

The model illustrates that the stress associated with the disaster experience may finally give rise to mental or physical disorders or disease.

John Cassel (5) states: "It is most unlikely that any given psychosocial process or stressor will be etiologically specific for any given disease, at least as currently classified." He further states: "In other words, it no longer becomes useful to consider a subset of existing clinical entities as 'stress' diseases as all diseases can in part be due to these processes." The important point is that a range of health outcomes, both mental and physical, need to be assessed in studies on stress or disaster since individuals may be more susceptible to health sequelae in one domain rather than the other.

The discussion of an appropriate disaster-stress-illness model has demonstrated that a situation in which the mental health effects resulting from disaster are considered separately from the physical health effects is a very artificial situation. This presentation will concentrate on the mental health aspects of disasters, but it is important to point out again that some disaster victims in a given disaster situation may be especially vulnerable in the physical health area while others may experience difficulty in the mental health area. It is even possible that the distinction into mental vs. physical health effects by various researchers has clouded the issue of what mental health effects, if any, may be associated with disaster.

The rest of this paper will be devoted to a brief overview of the present state of the art for the assessment of long-term mental health effects following disasters, some specific mental health findings from my own controlled survey of victims of the 1972 Agnes flood conducted five years after the event, and a final discussion.

MENTAL HEALTH EFFECTS FOLLOWING DISASTER

Short-term mental health problems noted immediately after impact and those which develop over the first few days or weeks have already been fairly well documented in the literature. The story relating to long-term health effects, including mental health effects, is only beginning to develop and is somewhat controversial. This, in my own mind, is due in large part to the paucity of well-conducted systematic, controlled studies.

As recently as 1972 when Karl Western, at the time a Medical Epidemiologist at the U.S. Center for Disease Control, submitted his dissertation on the Epidemiology of Natural and Man-Made Disasters to the Department of Tropical Hygiene and Public Health of the University of London, studies which dealt with the long-term effects of disasters were for the most part "non-existent" (6). The review by Kinston and Rosser (1) in 1974 also confirmed that there were a limited number of systematic "quantitative" studies on this subject. Also, as pointed out by these authors, very few epidemiological studies, such as Bennet's study (7) of the long-term effects of the 1968 Bristol floods, have been reported.

Both Melick (2) and I (8) conducted systematic controlled studies of the long-term effects of the 1972 Hurricane Agnes Flood in the Wyoming Valley of Pennsylvania as part of our doctoral research. We also reviewed the literature on the mental health effects of disasters, and, I think it would be fair to say, that we both concluded in our dissertations released in 1976 and 1978 that research in this area is still very incomplete.

A 1979 review by Quarantelli (9) of some major American natural disasters with respect to mental health findings revealed conflicting views on the subject.

The author proposes that two different positions - the individual trauma approach and the social fabric approach - exist in the disaster/mental health research field which has hindered "final closure" with respect to systematizing the mental health effects of major disasters.

If in the disaster/mental health research area a worthwhile, long-term objective is to test the causal significance of the association between disasters and mental health sequelae, then we may profit from a quick review of the five criteria which should be used to determine a true cause and effect relationship, i.e., the consistency, strength, specificity, and coherence of an association and the time sequence associated with the association.*

My own view is that we are not yet close to the time when a comprehensive review of findings may be employed to test causality with respect to disasters and mental health. Studies which appear to present conflicting findings compared to other published studies may merely be a manifestation of the well-known phenomenon of "regression to the mean." Put in a slightly different way, the scatter diagram portraying empirical findings from disaster/mental health studies may be characterized by a wide rather than narrow confidence belt about the estimated regression line because both study methods and instruments/criteria used to establish mental health sequelae are multitudinous.

I believe, at least at this stage of the art, that a more important approach to take in disaster/mental health studies is to focus on high-risk groups with respect to mental health sequelae and the risk factors resulting from the disaster experience which are significantly associated with mental health

*As an aside, you are referred to the 1964 Report of the Advisory Committee to the Surgeon General relating to smoking and health (10) and, in particular, Chapter 3 - "Criteria for Judgment" - for further details.

sequelae in these groups. For example, in the next section I intend to demonstrate how various stressful experiences in the recovery period following the Agnes Flood were better predictors of current mental health status as measured five years after the event than the actual disaster impact.

This ties in also, I think, with one final review on the mental health aspects of disasters which should be mentioned here, i.e., Chapter III of the 1979 NIMH handbook on Crisis Intervention Programs for Disaster Victims in Smaller Communities entitled "Mental Health Needs in Disasters" (11). An important point made in the chapter is the following: "While few researchers would claim that disasters create severe and chronic mental illness on a wide scale, victim populations do seem to undergo considerable stress and strain and do experience varying degrees of concern, worry, depression, and anxiety, together with numerous problems in living and adjustment in postdisaster." As indicated in the review, only the Buffalo Creek research has demonstrated a link between disaster and severe psychopathology. Although, as mentioned at the conclusion, further research is necessary to establish whether the "extreme environmental stress" associated with disaster has the "potential for inducing more longrun symptoms of psychological disorder in otherwise normal individuals," the reasoning which favors crisis intervention as a strategy for meeting disaster-generated needs is important to note. It goes as follows: "If providing additional sources of social and psychological support can change a victim's environment, it is possible to alter the effects of the stress induced by disasters, thus reducing the chance that otherwise transient disorders will persist."

In the next section I intend to illustrate, based on research with

victims of the 1972 Agnes Flood, that mental health-related sequelae persist throughout the recovery period, that events experienced in the recovery have an even greater impact on future mental health than the initial experience of being flooded, and finally, that risk in the mental health domain appears to be correlated with stress due not only to the flood recovery but also to low levels of psychosocial assets and major life events.

A CASE STUDY: FIVE-YEAR FOLLOW-UP OF VICTIMS OF THE AGNES FLOOD

In 1977 as part of my doctoral research at Columbia University School of Public Health, I conducted a retrospective survey of female victims of the 1972 Agnes Flood in Pennsylvania. Briefly, the survey was designed to investigate the long-term effects of the Agnes Flood on mental and physical health and other domains during the recovery period (strategy 1) and post-recovery period (strategy 2). The study involved a flood group of 396 households and a control group of 177 households, both groups representing probability samples of the affected and non-affected adjoining communities. Complete details on sample selection and the study methodology including the survey instrument are available elsewhere (8).

Three self-rating scales, i.e., Langner's 22-item screening instrument (12), Zung's 20-item Self-Rating Depression Scale (13), and a modified version of the Self-Report Symptom Inventory or SCL-90 (14), were utilized to assess current problems in the mental health domain at the time of the survey, five years after the event or in the post-recovery period. Other items on the questionnaire were regarded as indicators of mental health distress with respect to both the recovery period and the post-recovery period, and findings for some of these indices will now be presented.

STRATEGY 1: THE RECOVERY PERIOD

I first want to quickly review some of the effects which pertain to the recovery period following the Flood. These results and others are discussed in a recently published paper on the emotional and physical distress following Hurricane Agnes relevant to the recovery period (15).

Briefly, it was found that 76% of the Flood respondents perceived the distress associated with the recovery as either moderate, severe, or very severe compared to 30% of the non-Flood respondents. The median response for the perceived duration of the recovery period by members of the Flood group was 18 months, the modal response corresponded to more than two years. Emotional distress was experienced by 79% of the Flood group and 53% of the control group for more than six months. An even finer breakdown revealed that 57% of the Flood group compared to 35% of the control group still experienced emotional distress 18 months or more following the events. In general, both emotional and physical distress lasted about one year longer among the Flood group than among the control group.

Other indicators of mental health distress discussed in the report included a significantly greater use of tranquilizers, sedatives, and alcohol among Flood respondents compared to the controls.

STRATEGY 2: THE POST-RECOVERY PERIOD

As mentioned earlier, the survey was conducted five years after the event and a second study strategy was to investigate the effect of the Flood impact and also the effect of stressful experiences during recovery on mental health during the post-recovery period, particularly as measured five years after the event at the time of the survey. A report which focuses on the post-recovery mental and physical health effects of Agnes is currently under review as a possible follow-up to the earlier referenced paper which focused on the recovery period.

We factor analyzed those variables which appeared to represent major stressful experiences in the recovery period (Slide 2). The most important dimension, Factor 1, appeared to represent a dimension of general distress. The variable with the highest loading for Factor 1 was item 15, "state of mind" after the Flood, followed by item 36, "amount of distress" experienced in the recovery. Factor 2 which only consisted of two items represented difficulty in obtaining medical care in the recovery.

The next slide (Slide 3) displays the adjusted means and associated probability values based on a series of covariance analyses using Total Langner and Total Zung scores as dependent variables or mental health outcomes. Complete details on the analytic procedures, again, are presented elsewhere (8). The important point is that the stressful experiences in the recovery period are treated as independent variables and the designated subgroups represent internal comparisons within the Flood group. As a point of comparison, I illustrate at the bottom of the slide the results of covariance analyses comparing the Flood and non-Flood groups for Total Langner and Total Zung.

An inspection of Slide 3 will reveal that certain subgroups within the Flood group are at higher risk than others with respect to mental health sequelae as measured by the Langner and Zung scales. For example, a subgroup of 70 women who experienced great stress in the recovery period based on the multivariate index, Factor 1, showed adjusted mean scores of 6.42 for Total Langner and 42.4 for Total Zung. Also, as indicated in the Table, there were statistically significant differences among/between groups for both Total Langner and Total Zung in the case of Factors 1 and 2 and item 11, the use of alcoholic beverages during the recovery.

Although data will not be presented, I finally want to quickly review some findings on the joint effect of stress experienced in the recovery period, psychosocial assets, and other major life events. These and other results will be presented in a forthcoming publication (16).

Basically, the approach we followed was to divide the Flood group into eight subgroups corresponding to the eight possible combinations of low vs. high perceived stress for the recovery, low vs. high perceived stress for psychosocial assets, and finally low vs. high perceived stress for major life events. We hypothesized that the subgroup at highest risk of mental health sequelae as measured again by total scores on the Langner and Zung scales would be the subgroup at high stress for the three main effects just described.

Our results did in fact confirm that, in most cases, the subgroup with the highest total scores for Langner and Zung was the subgroup which experienced high stress because of the recovery, low levels of psychosocial assets, and high stress because of major life events.

FINAL DISCUSSION

The purpose of this presentation was not to provide a comprehensive review of the state of the art of disaster/mental health research but rather, through a brief overview of the literature and some findings from a survey of victims of the Agnes Flood, to highlight some important substantive and methodologic issues in disaster research and to suggest some fruitful areas for future research. First let me turn my attention to issues.

SUBSTANTIVE AND METHODOLOGIC ISSUES IN DISASTER RESEARCH

I commented earlier on a disaster-stress-illness model which Melick, Struening, and I describe in an upcoming report. In addition to this model, other disaster researchers have done some very interesting work in the area of conceptual model building as illustrated, for example, in the recent paper by Perry and Lindell (17) or by Berren, Beigel, and Gherten (18). This theoretical model is most important to the design of an empirical study since it delineates other factors or variables in addition to the disaster, the independent variable, and mental health effects or health effects in general, the dependent variables. These other variables may mediate the effect of the disaster under investigation on subsequent health status in either negative or positive ways.

Despite differences in conceptual models, three categories of variables are necessary to construct the general model of an individual's reaction to disaster: (1) characteristics of the disaster, (2) range of health outcomes, (3) variables which modify the effect of the disaster on health. I have stressed the need for the collection of a full range of health outcomes in a well executed empirical study, so I will not dwell on that aspect here. Also, mediating variables have been fairly well described in both stress models and disaster models, so I would like to consider some key issues associated with the disaster event itself which have been highlighted because of some recent events.

First of all, whether a disaster is natural or man-made, some events seem to be generally accepted by the victims as an "act of God". In many other cases however, victims tend to attach "blame" for the event

to someone or something. The Buffalo Creek Flood, Love Canal, and Three Mile Island may all be characterized as "preventable" events. On a priori grounds, one may expect preventable disasters to be more stressful for its victims than the non-preventable events.

The time factor associated with disaster impact and other subsequent stages of the disaster is most important with respect to potential health sequelae. For example, in our research we demonstrated that the average perceived duration of the recovery period for victims of the Agnes Flood was about 18 months. It is difficult to attach a time estimate to disaster impact or disaster recovery for the Love Canal incident. Recall that Federal emergency declarations were made in 1978 and again in 1980. Perhaps as early as 1977 or even earlier people in the affected neighborhoods perceived that their health may have been in danger.

These two issues and others may be incorporated into two categories of disaster-related variables: (1) objective losses and (2) perception/evaluation of the experience. With some major natural disasters, the stress associated with the event may pertain primarily to variables in the first category. I think an example here would be the 1974 tornado in Xenia, Ohio, which resulted in extensive objective loss but minimal "perceived" stress. Other natural disasters such as Buffalo Creek and even the Agnes Flood may generate extensive stress based on both categories. Recent technological disasters such as Love Canal and Three Mile Island, on the other hand, result in little objective loss but high perceived loss or stress. There are other issues which need to be tied in here also such as whether an event is perceived as an act of God or a result of man's carelessness and negligence, whether the community has been prepared for the event, possibly because of earlier encounters with disaster, whether evacuation has taken place on a large scale, and whether the event

appears to have an irrevocable effect on one's life such as in the case of Love Canal and possibly Buffalo Creek.

Generically, some natural and even technological disasters may be perceived by its victims as "dirty" events which result not only in great personal loss but also extensive "contamination" to the community. On the other hand, some major events which result in extensive objective loss and possibly high perceived stress may still be considered "clean" by its victims.

While researchers may find it difficult, it not impossible, to measure all potential disaster-related independent variables, what does seem to be in order in future empirical studies are some "global" indices of perception or appraisal of the event in order to get at the very critical question of individual response to disaster.

In order for a theoretical model to be useful, however, it must be applied. This, I feel, has been neglected with respect to many empirical studies and may also be partly responsible for some of the apparent inconsistencies among studies of disaster on mental health. The plan for the application of the conceptual model should enter the design stage of the study concerned with analyses of the data. Analytic strategies which adopt the "multivariate" rather than "univariate" approach are especially important in order to control for confounding factors, determine the joint effect of many independent variables, including the disaster experience, on health outcome, identify high-risk groups, and perform other study strategies. This approach was illustrated earlier, e.g., in the discussion on the joint effects of disaster, major life events, and low psychosocial assets on mental health.

In addition to a conceptual model, important issues which need to be considered in the overall design stage of a study include:

- method of selection of study sample (probability vs. other)
- use of control group(s) and nature of group(s) (matching vs. no matching)
- specific study design (cohort or longitudinal vs. other)
- statistical estimates of adequate sample size - α and β considerations
- method of data collection for mental health effects/criteria used for case determination

- self-reporting
- professional mental health interviewers
- other trained interviewers
- rating scales (self-report vs. interview)
- official health records
- other

- use of "baseline" information to adjust for pre-existing psychopathology
- collection of other data which may serve as confounding variables

Other methodologic issues apply to the conduct of the study, analysis of the data, and final report writing such as:

- nature and number of non-respondents and excluded individuals
- assessment of potential bias
- nature of various statistical procedures and rationale for their use
- final interpretation of data analyses/limitations of study/potential inferences

Although the 1974 review paper by Kinston and Rosser (1) considered some important methodologic issues, a major updated methodologic review paper on empirical disaster/mental health studies would serve the research community by systematizing the different approaches used by various researchers. The review should include all of the issues important to the design, conduct, analysis, and interpretation of an individual study and would summary these issues across the major empirical studies.

RECOMMENDATIONS

A number of recommendations may be generated from a forum on the mental health aspects of disaster, and I would just like to propose a few which I believe to be timely ones. I hope that these suggestions will act as a catalyst for some fruitful discussions on the need for clearly defined recommendations in this area.

1. In designing empirical studies, conceptual or theoretical models need to be developed which describe independent variables applicable to the disaster experience, dependent variables applicable to all possible health outcomes, and mediating variables. Further, the model needs to be applied to the data gathering and analysis stage of the study. In the analysis stage, appropriate statistical procedures such as multiple contingency table analysis, analysis of variance or covariance, and regression analysis should be implemented.

2. In executing an empirical study, a range of health outcomes in both the physical and mental health domains need to be assessed. Further, recognizing that different methods of assessing mental health effects usually give rise to different findings, the study design should allow for a number of methods to assess mental health sequelae. For example, a random sub-sample of victims may be interviewed in depth by trained mental health professionals and findings based on this method can then be compared with the method applied to all study victims.

3. We need to do further research on how negative experiences in the disaster recovery period correlate with long-term mental health sequelae.

4. The time factor in a disaster should be examined more closely with respect to all disasters, especially with the new technological disasters where little or no objective loss has been experienced.

5. We need to compare the findings from natural and technological disasters and disasters with long rather than short impact in order to determine what differences, if any, exist with respect to short-term and long-term mental health sequelae. In particular, more research should be done on how individual perception of the disaster experience correlates with subsequent mental health sequelae.

6. Empirical mental health studies on Federally declared "major" disasters should be compared with similar studies of lesser severity, e.g. Love Canal and Three Mile Island, with respect to needs assessment and other issues. The question is how effective is the major disaster declaration as a criterion for selecting those most in need with respect to emergency mental health services. Clearly, a number of major disasters have occurred which resulted in little, if any, significant mental health sequelae. On the other hand, other events which did not qualify as major disasters, such as Love Canal (19), appeared to be associated with important mental health sequelae.

Finally,

7. Further research is necessary concerning high-risk groups in the mental and physical health area. Using epidemiologic study approaches, e.g., through the use of pilot case-control studies, risk factors may be delineated and prioritized. The identification of such risk factors should have a direct bearing on future intervention strategies.

Acknowledgment

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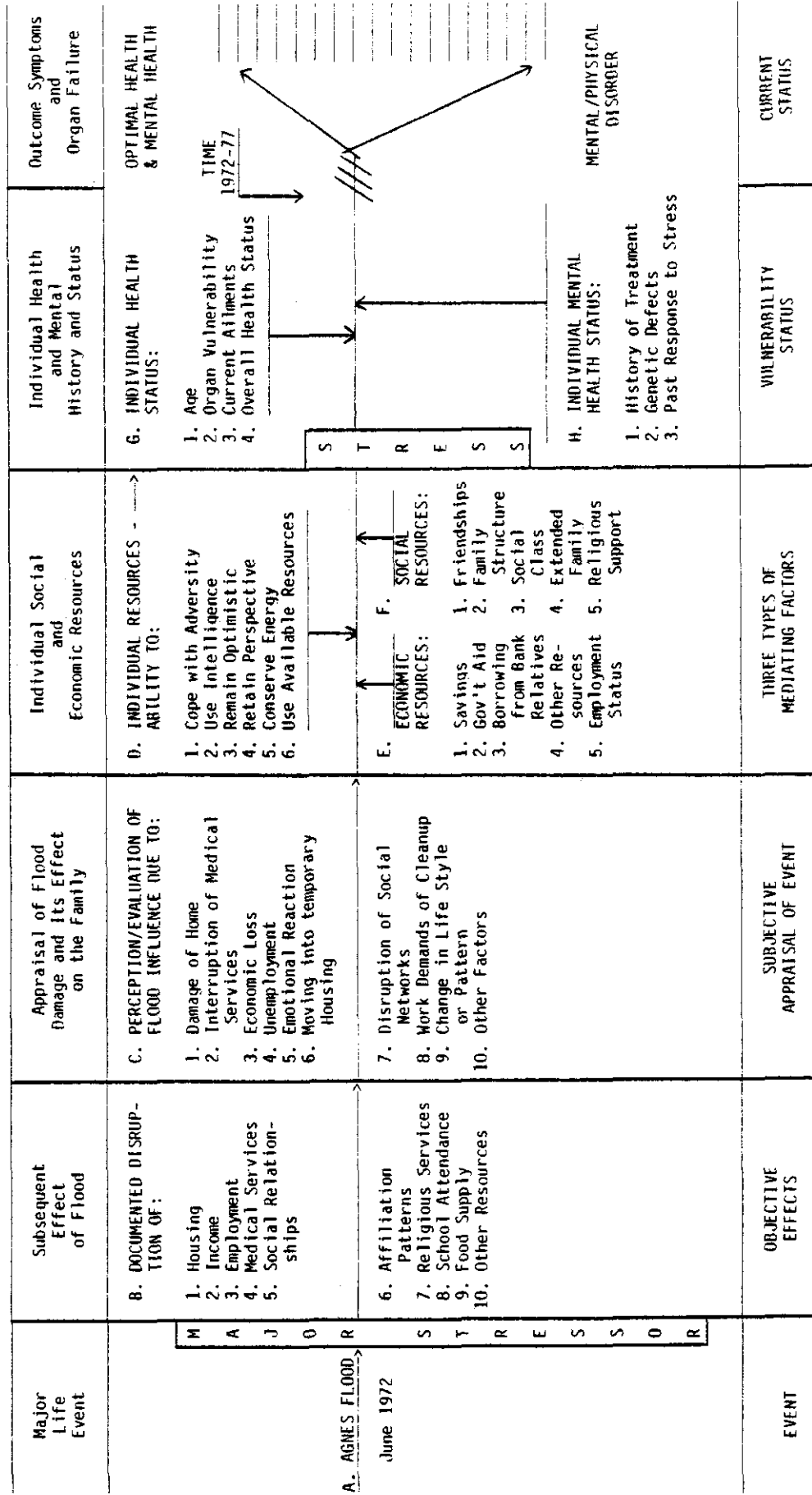
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SLIDE 1

APPLICATIONS OF A STRESS MODEL TO A MAJOR NATURAL DISASTER



SLIDE 2

Questions (Variables) Specifically Relating to the Recovery Period

- | | | |
|--|---|---------------------------------|
| (10) Tranquilizers or other medications used in recovery period | } | F A C T O R 1 |
| (15) State of mind after the flood | | |
| (17) Financial problem because of the flood | | |
| (20) Feelings about people trying to cheat the respondent during the recovery period | | |
| (21) Feelings about physical work done in recovery period | | |
| (36) Amount of distress, in general, experienced in the recovery period | | |
| (100) Length of the recovery period | | |
| (70) Obtaining regular medical check-ups hindered by the flood | } | 2 |
| (71) Treatment of specific medical problems hindered because of the flood | | |
| (8c) Perceived damage to home and possessions | | |
| (11) How helpful were alcoholic beverages in recovery period | | |
| (16) Estimate of monetary loss with respect to property damage | | |
| (27) Stress because of unemployment | | |
| (50) Temporary living quarters during the recovery period - rating how stressful the experience was for the respondent | | |

SLIDE 3

| Independent Variables | Total Langner | | | "p" | Total Zung | | | "p" |
|-----------------------|---------------|-------------|-------------|-------|-------------|-------------|-------------|-------|
| | Stress | | | | Stress | | | |
| | Low | Medium | High | | Low | Medium | High | |
| Factor 1 n= | 2.55 75 | 3.70 119 | 6.42 70 | ≤ .05 | 34.5 75 | 35.3 119 | 42.4 70 | ≤ .05 |
| Factor 2 n= | 2.98 140 | 4.96 76 | 5.95 48 | ≤ .05 | 34.9 140 | 38.6 76 | 40.3 48 | ≤ .05 |
| 8c n= | 3.78 119 | | 4.34 145 | NS | 36.6 119 | | 37.2 145 | NS |
| 11 n= | 3.66 193 | | 5.26 71 | ≤ .05 | 36.1 193 | | 39.2 71 | ≤ .05 |
| 16 n= | 3.50 100 | | 4.45 164 | ≤ .10 | 36.3 100 | | 37.3 164 | NS |
| 27 n= | 3.72 201 | | 5.27 63 | ≤ .05 | 36.5 201 | | 38.4 63 | ≤ .10 |
| 50 n= | 3.55 160 | | 4.92 104 | ≤ .05 | 36.6 160 | | 37.5 104 | NS |

| | | | | | | | | |
|--------------------------|-------------|--|-------------|-------|-------------|--|-------------|----|
| Flooding No/Yes n= | 3.23 125 | | 3.93 312 | ≤ .10 | 35.4 118 | | 37.0 282 | NS |
|--------------------------|-------------|--|-------------|-------|-------------|--|-------------|----|