

## EVACUATION DECISION-MAKING IN NATURAL DISASTERS\*

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When seeking to manage the consequences of natural disaster, evacuation is an important tool in the hands of authorities. In particular, evacuation which is instituted *before* disaster impact can result in the preservation of life, reduction of personal injuries, and the protection of property. Thus, when there is sufficient forewarning – and evacuation is an appropriate coping strategy – pre-impact evacuation of a threatened population is an effective means of mitigating the negative consequences of natural disaster.

As a means of adjusting to natural hazards, evacuation is a process with a very long history. As early as the fifth century B.C., the Greek historian Herodotus described Egyptian evacuations in the face of the seasonal flooding of the Nile River. Indeed, evacuation is a concept which pervades journalistic, popular and professional literature on disaster. In spite of its apparent ubiquity, however, very little attention has been devoted to examining variables which are important in individuals' decisions to evacuate in response to a disaster warning.

This paper will review empirical studies of

warning response, particularly focusing upon pre-impact evacuation of threatened populations, and summarize the available findings. The summary may be seen as a conceptual framework of inter-related hypotheses describing the relationships among variables which *past research suggests* are important in individuals' decisions to evacuate. This paper should not be seen as an attempt to develop a formal theory. Instead, it represents an effort to order the empirical literature by organizing existing findings into a general conceptual framework. The remainder of the paper is structured around three primary tasks: (1) development of a theoretical perspective of evacuation behavior; (2) a review of empirical literature; and (3) assembling findings into a tentative framework.

### EVACUATION IN THE CONTEXT OF WARNING RESPONSE

Much of the early social scientific research on evacuation was conducted within the framework of man-made rather than natural hazards. Following World War II, a number of studies were released which focused on German (United States Strategic Bombing Survey, 1947a), Japanese (United States Strategic Bombing Survey, 1947b), and English (Titmuss, 1950) efforts to remove people from threatened cities and at the same

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time maintain the production and flow of military support goods. This literature however, tends to focus upon either the social psychology of stressful life events, or problems in the logistics of administration in evacuated areas (cf. Titmuss, 1950: 177–180). Although some research focused upon psychological factors in motivating families to evacuate and remain away from their homes (Janis, 1951), most studies were reports of the relative success or failure of various evacuation efforts and not specific attempts to integrate findings or develop principles for understanding the process of evacuation.

Although several studies conducted in the past decade have focused upon problems of evacuation (Drabek and Boggs, 1968; Drabek, 1969; Drabek and Stephenson, 1971; Mileti and Beck, 1975), there remains a paucity of analytic models which identify important variables and specify patterns of expected relationships. While research on evacuation in natural hazards has largely examined pre-impact attempts to remove threatened families, the literature is fairly small and widely scattered. Furthermore, some of the most comprehensive research was conducted as long ago as the middle 1950's (cf. Lammers, 1955, on the Holland floods). In this section, a theoretical context for evacuation will be developed as an initial step toward laying the basis for a framework describing the determinants of evacuation in natural hazards. The focus here is upon describing factors in *voluntary evacuation* which takes place prior to disaster impact.

Historically, students of natural hazards have treated evacuation as one possible protective measure which may be taken in response to a hazard warning message. Hence in the literature of disaster research, the study of evacuation is usually subsumed under the general rubric of warning systems and individuals' adaptive or protective responses.

Most of these studies have used a social systems' view of warning processes (Chapman, 1962; Janis, 1962; Williams, 1964; McLuckie, 1970; Mileti, 1974). Such models typically emphasize macroprocesses operating on an aggregate level; concern is with detection–dissemination subsystems, response subsystems and the like. For example, Harry B. Williams (1964) basic warning response model is composed of parameters which are structural in nature. This essentially four-phase model represents the warning process in terms of:

1. Sources of information about the nature of the threat;
2. The official decision to issue a warning;
3. The channels through which the warning is communicated to the public; and
4. The response of the public.

Systems models have proved quite useful for research in which the primary unit of analytic interest is the community (cf. Dynes et al., 1972). Taken alone however, system models of community warning processes are less useful in representing factors that shape individual or family behavior.

Consequently, investigators interested in the individual as a primary unit of analysis have usually supplemented the social systems' framework with some social-psychological model. Such models have included psychoanalytic and psychodynamic framework (Tyhurst, 1951; Menninger, 1952; Leopold and Dillon, 1963), reference group or role theory approaches (Anderson, 1968; Form and Loomis, 1956), symbolic interactionism (Drabek and Boggs, 1968; Drabek, 1969), and behavioral principles (Mileti, 1974:35–46). The theoretical problem which must be given careful consideration when choosing a supplementary framework centers upon the difficulty some models have in allowing for the fact that processes important in warning response decisions proceed simultaneously at two levels of abstraction. For

example, we know that the individual's assessment of personal risk and the reality of the disaster threat are important factors in his decision to evacuate. But it is also known that two additional factors related to community preparedness, the content of the warning message and number of times it was received, contribute to assessments of risks and the formation of warning belief. Thus, we must be concerned *both* with aspects of the individual and attributes of the community system.

Psychoanalytic theories are not easily adapted to the consideration of factors *external* to the individual in explaining warning response (cf. Lifton and Olsen, 1976) and Mileti (1974:163–166) reports empirical difficulties in adapting behavioral principles to studies of warning responses. Descriptive research using a symbolic interactionist perspective appears promising, but as yet no systematic attempt has been made to explicitly formulate an analytic model based upon this approach. Recently some attention has been devoted to integrating one or more of the social-psychological perspectives with a systems model, thereby producing a flexible analytic paradigm which either implicitly or explicitly acknowledges the operation of processes at several levels of abstraction (cf. Drabek, 1969:336–337, Drabek and Stephenson, 1971:199–202; Gillespie and Perry, 1976:303–305; Perry et al., 1974:115–119).

Gillespie and Perry (1976), in an attempt to refine Barton's (1970) systems model of disaster behavior, have argued that by integrating the premises of an emergent norm approach to collective action (cf. Turner, 1964:389–392); Turner and Killian, 1972: 21–25) with a systems perspective, one gains the flexibility necessary to adequately characterize processes and interrelationships which prevail at both individual and community levels of abstraction. The adoption

of an integrated systems-emergent norm approach also provides a framework for the *temporal ordering of factors* in personal reaction to warnings and helps to isolate important theoretical dimensions.

The emergent norm approach has been developed primarily by Ralph Turner and Lewis Killian (1972) as an alternative to contagion and convergent perspectives on collective behavior. Emergent norm perspectives focus upon the development of situational norms and expectations which arise as a function of some crisis or change in the social or physical environment which renders traditional norms inappropriate (cf. Fritz, 1957:8, Form and Nosow, 1958:14–28; Barton, 1963:20–22; Anderson, 1969:92–93; Anderson, 1968: 298–307). Drabek (1968:143–144) has succinctly summarized the emergent norm orientation to disaster behavior:

Societies are composed of individuals interacting in accordance with an immense multitude of norms, i.e., ideas about how individuals *ought* to behave... Our position is that activities of individuals... are guided by a normative structure in disaster just as in any other situation... In disaster, these actions... are largely governed by *emergent* rather than established norms, but norms nevertheless.

Thus, human behavior in disaster can be conceptualized as nontraditional behavior in response to a changing or changed social and physical environment. The emergent norm perspective is concerned with the *process* beginning with changes in the stimulus environment which requires a new (or different) "definition of the situation" and ending with some change in the individual's behavior which is responsive to this different definition of the situation. With respect to the study of warning response, warning itself serves as the event which signals that a pending change in the environment could render traditional (established) norms inoperative. Thus, a redefinition of the situation is required, and situational norms are developed to cope with

the changed social and physical environment. The human response of interest is the act of evacuation – and the cluster of situational norms which encourage individuals to undertake that act or some other appropriate personal protective measure.

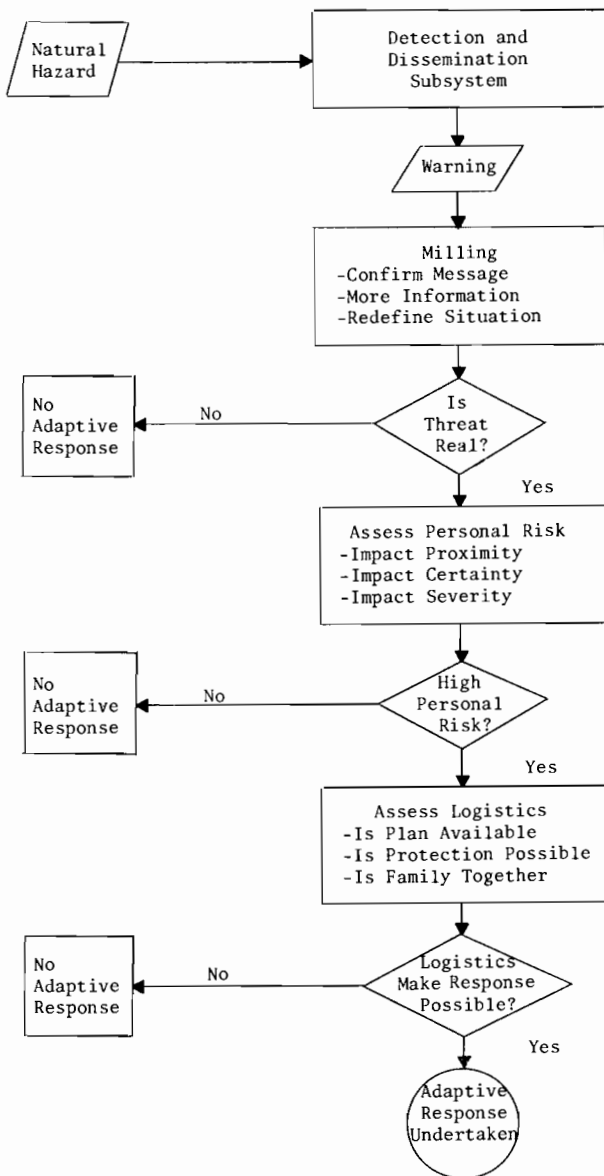


Fig. 1. Flow diagram of systems-emergent norm issues in individual response to natural hazard warning (arrows represent temporal paths).

The adoption of an emergent norm perspective highlights important processes typically ignored when systems theory is used alone: namely, those processes that operate *between* the issuance of a call to evacuate and the public response. Furthermore, a careful review of existing theoretical and empirical literature permits the isolation of specific processes that occur as part of post-warning redefinition of this situation. From the standpoint of an emergent norm approach, whether or not the desired response (e.g., evacuation) occurs is dependent upon the outcome of this process of redefining the situation. The major processes involved in post-warning attempts to restructure the normative environment are illustrated in Fig. 1. First, there is an initial milling process which focuses upon *confirming* the warning message, gathering further information and establishing a warning belief. Assuming that a warning belief is established, further milling centers upon the problem of assessing personal risk – the determination of one’s *proximity* to the impact area and the individual’s perception of the *certainty*, and probable *severity* of disaster impact. Finally, if personal risk appears high, necessitating some adaptive response, individuals assess the logistics of making such a response. Only *after* these processes have operated are we able to suggest that any protective response (evacuation or otherwise) will be undertaken.

It should be emphasized here that concern is with the application of certain tenets of emergent norm thinking to the problem of warning response in disaster. It is *not* the goal of this paper to elaborate an emergent norm “theory” of human behavior and derive from it propositions which explain evacuation decision-making. While such an undertaking would be commendable and in keeping with the highest standards of the philosophy of social science (cf. Homans, 1967; Blalock, 1969; Wallace, 1971), it is

both beyond the scope of the present paper and unnecessary for the task at hand. Indeed, to utilize emergent norm imagery (or any other theoretical perspective for that matter) to structure a problem which is subsequently addressed in terms of the existing empirical literature certainly does not depend upon a formalized elaboration of the theory. Finally, it is acknowledged that, as an approach to the study of collective behavior, emergent norm theory (like any other theory) has strong and weak points (see Tierney, 1977 for a thoughtful critique). Note, however, that emergent norm theory does unequivocally provide what is sought for this paper; namely, a set of ordering assumptions upon which a general framework for viewing evacuation behavior may be based (cf. Weller and Quarantelli, 1973:674).

#### DETERMINANTS OF EVACUATION BEHAVIOR

The emergent norm perspective, as outlined above, suggests three variables of major importance in evacuation: (1) the presence of an *adaptive plan*, (2) the individual's *definition of threat as real* (i.e., the development of a warning belief) and (3) the level of *perceived risk*. In addition to these variables which are included on theoretical grounds, there is considerable consensus in the empirical literature regarding the importance of three more variables: the *family context* in which the warning is received, the patterns of *kin relationships* in which the family is enmeshed and the level of *community involvement*. Using these six variables as a starting point, the following sections review pertinent research findings to identify other variables which are antecedent to these and assess the interrelationships among all of the variables, as well as the impact of each upon the target response — evacuation.

#### Adaptive plan

Studies of evacuation often overlook the fact that in order to effectively clear an area, residents must either have prior knowledge of some standing evacuation plan or be informed of such a plan by officials. Hamilton et al. (1955:120) interviewed a disaster victim who reported:

We couldn't decide where to go or what to do. So we grabbed our children and stuff and were just starting to move outside. Where if it had just been ourselves, we might have taken out. But we didn't want to risk it with the children.

This family received a warning to evacuate, but had no plan which identified safe routes for exit or appropriate destinations. Thus, even if one wants to evacuate, the absence of a plan for so doing is sufficient to hinder any adaptive response.

The problems of families *not* evacuating (or evacuating to an even more dangerous location) when evacuation routes and destinations are not well known or well published has been widely documented with a variety of types of natural hazard (cf. Windham et al., 1977:15). Although not universally implemented, most manuals for community predisaster preparation encourage the planning and dissemination of evacuation routes (cf. Leonard, 1973; Healy, 1969). Therefore, the possession of adaptive plan, at a very minimum, a route and safe destination, is positively related to the probability of evacuation.

Research indicates that individuals' knowledge of an adaptive plan depends largely upon two factors: warning content and prior experience. Williams (1964:91–93) has pointed out that the most effective warning messages are clear, specific, consistent and, if possible, contain instructions for an appropriate protective response. The warning message itself, whether delivered via official

channels or through kin and friendship networks, is one source of an adaptive plan. It has also been reported that the *experience* of warning and/or evacuation provides the individual with a potential adaptive plan for future hazards, simply by replicating his past behavior (Bernert and Ikle, 1952:133–135).

#### Perception of threat as real

For *any* adaptive response to be defined as necessary, the individual must perceive the threat described in the hazard warning to be real. Hence, unless the warning is believed to be valid, no action (protective measure) is likely to be undertaken (cf. Janis, 1962:59–66; Williams, 1964:94; Anderson, 1968:299–304; Mileti, 1975:21–23; Janis and Mann, 1977). The importance of establishing a situational definition of real threat is underscored by the existence of a large empirical literature detailing the ways in which people go about *confirming* hazard warnings (Drabek, 1969:344; Drabek and Stephenson, 1971:195). In general, the empirical literature indicates that the greater the perceived threat the greater the probability of evacuation.

Four factors important in producing a warning belief or enhancing the individual's perception of threat may be derived from existing research findings: warning content, prior experience, the number of warnings received and the warning source. Warning content and prior experience with disaster are important in that each affords information to the individual upon which an assessment of threat is made (Lachman et al., 1961:1409). A warning that contains precise information about the hazard and its probable consequences is more likely to create the "reflexive fear" which contributes to the individual's belief that the warning is to be taken seriously (Janis, 1962:59–66;

Levanthal et al., 1967:314). Anderson (1969:100) has also pointed out that individuals who have recently experienced a natural hazard are more sensitive to warnings and are more likely to attempt some adaptive response. Indeed, a study of people who left their homes in response to what turned out to be a false warning reports that "few of the evacuees complained about being misled by the false alarm: the vast majority said that they would evacuate again under the same circumstances" (Janis, 1962:85). Assuming that a warning is confirmed, it can be argued that previous experience with disaster (even with false alarms) enhances warning belief and the probability of an adaptive response. A recent study of evacuation in response to hurricanes on the Gulf coast would seem to contradict this contention by reporting that a large proportion of people who failed to evacuate were long-time residents of the area who presumably had previously experienced the problem (Windham et al., 1977). Two qualifiers must be considered in the interpretation of this finding. First, the data are *not* unequivocal; two communities were studied and in one of them, the proportion of people with prior experience is nearly the same among both "stayers" and "leavers". Secondly, hurricanes on the Gulf coast are a recurrent disaster threat, with possibly *several impacts* in a single season. Although empirical studies are not available, it is possible to speculate that under such conditions prior experience becomes a "constant" with *no* relationship to evacuation. This is another possible interpretation of the Windham et al. (1977:29) study. A more cautious interpretation of the data, however, would suggest that recent experience with a valid warning contributes positively to the development of a warning belief (i.e., perception of real threat).

There is evidence that the number of warnings an individual receives increases the

chance of an adaptive response. Drabek (1969:340–341) has indicated that a frequent response to an initial warning is disbelief; although subsequent warnings may provide no new information, it is argued that repetition increases warning belief (Mileti and Beck, 1976). Numerous studies have shown that individuals rarely evacuate after hearing a single warning and that additional warnings enhance the probability of evacuation (Mileti, 1974; Fritz and Marks, 1954: 41, Fritz and Mathewson, 1957:51–53).

Finally, research indicates that the more credible the source from which one receives a warning, the more likely one is to believe that the threat is real. Drabek and Boggs (1968:445), in a study of flood warning response, report that “families were warned through three distinct processes: (1) authorities, (2) peers, (3) mass media... those warned by an authority were less likely to be skeptical of the warning.” The warning confirmation literature generally supports this contention, suggesting that people more often seek other sources for confirmation when they receive warnings from peers or media than when the source is an authority or kinsman.

#### **Personal risk**

In assessing personal risk, concern centers upon the individual’s perception of the probability that impact of the hazard agent will result in great damage or destruction to his person or property (cf. Fritz and Marks, 1954:29–31; Diggory, 1956). Withey (1962: 104–107), in developing a series of stages of reaction to threat, emphasizes the importance of the individual’s perception of “the probability of the impending event occurring [and] the severity, to the individual, of such a development.” Put slightly differently, personal risk may be thought of in terms of individual’s conception of his proximity to impact and the certainty and severity of the

impact. Studies have shown that the perception of personal risk has a direct affect on the nature of the individual’s response to a warning (Menninger, 1952:129; Williams and Fritz, 1957:46–50; Withey, 1964:86).

Glass (1970:64–67) in discussing “contingency responses” to threat points out that unless a person is convinced that impact is certain and that he is within the danger area, there is general reluctance to cooperate with emergency plans. Menninger (1952), in reporting evacuation problems during the summer of 1951’s Kansas floods found that “an amazing number of people refused to believe that the flood would hit them... [and].. would not move themselves or their belongings out of their houses.” Similar findings have been reported by Tyhurst (1951:764), and Danzig et al., 1958:51–53). Thus, it can be argued that a direct relationship exists between personal risk and the probability of evacuation.

Warning content and prior experience have been shown to be closely related to the individual’s level of perceived personal risk. It is fairly routine that warning messages of an impending natural hazard contain information on where, when, and the probable force of disaster impact (Mogil and Groper, 1977; Moore et al., 1963:31–33; Williams, 1957: 15–19). Furthermore, the individual’s prior experience, as well as his reading of environmental cues, contributes to the perception of personal risk (Drabek and Boggs, 1968:445–447; Windham et al., 1977:49).

#### **Family context**

As Killian (1952) has indicated, the study of human behavior in disaster must take into account the network of community and family roles in which the individual is immersed. Furthermore, research to date suggests that in the event of conflicting responsibilities among various roles, “the majority of persons involved in such dilemmas resolve

them in favor of loyalty to the family..." (Killian, 1952:311). In particular, we know that families faced with disaster seek to protect members (Quarantelli, 1960) and generally perform as units when undertaking any protective behavior. Studies of evacuation have revealed that "when they did evacuate, families left as units... these data provide additional support for the hypothesis that families move as units and remain together, even at the cost of overriding dissenting opinions" (Drabek and Boggs, 1968:446). Support for the contention that families evacuate as a group may also be drawn from studies of the bombing of London during World War II (Titmuss, 1950:172; Bernert and Ikle, 1952:133–135). The primary consequence of these findings is to introduce an additional constraint on evacuation: unless the family is together or missing members are safely accounted for, evacuation will not occur. Thus, family context is positively related to the probability of evacuation.

Ethnicity and age indirectly effect family context. Family structure as well as kin relations, vary among ethnic groups. Staples (1976:123), for example, reports that "... the Black kinship network is more extensive and cohesive than kinship bonds among the White population... a larger proportion of Black families take relatives into their households." As indicated above, the structure of the household is important in defining family context. Age of the head of household is important for family context in two ways. In general, age correlates with the life-cycle position of the family, and especially among minorities, with the generational depth of the extended family household (Lansing and Kish, 1957:512). Furthermore, the presence of aged persons in a household (or a household composed of aged people), has been cited by disaster researchers as a factor which complicates family evacuation by increasing the complexity of family role responsibilities. Thus,

Ellemers (1955:421) points out that "old and sick people were unable to leave their homes at the time of the flood warning." Hill and Hansen (1962:186) have also observed that the "extended family household is poorly organized to meet threats and hardships, for its very young and very old members are often ill-equipped to meet such sudden challenges." In terms of our knowledge of family tendencies to adapt to disaster as a unit, it becomes clear that such "deficiencies" of individual family members reflect upon the performance of the group.

#### **Kin relationships**

Kin relationships are here conceived in terms of people's interaction and exchange patterns with their kinsmen. Several studies of communities in disaster have pointed out that very close kin relationships promote post-disaster recovery success among victims (Drabek et al., 1975:486; Bolin, 1976:268; Drabek and Key, 1976:90). Although less often studied, kin relationships also play an important role in the warning dissemination process and, consequently, in the promotion of successful adaptation to disaster warning (Clifford, 1956:113–124). In particular, one's interaction patterns with kin have an impact upon the content, source and number of warnings an individual receives.

Drabek and Stephenson (1971:199) report that "extended family relationships were crucial as warning messages and confirmation sources... telephone conversation with relatives during the warning period were usually a key factor." Official warning messages broadcast via mass media are sometimes vague, often not heard by all the potential victims, and are usually confirmed via some other source (Mileti and Beck, 1975:30; Drabek, 1969:341; Bates et al., 1963:11–13). Thus, kinsmen can supply both additional information (i.e., warning content), and serve as con-



firmation sources for hazard warning. It has also been found that people who hear disaster warnings relay the information to kinsmen who reside within the probable impact area (Drabek and Boggs, 1968:445–447). This has the immediate effect of *increasing* the number of warning messages received by potential victims. Furthermore, during such contacts help from kin which may promote a successful adaptive response to the warning may be offered or solicited. In studying flood evacuations, Drabek (1969:345) found many victims who evacuated in response to a relative's invitation to "come over and spend the evening just in case this thing might be serious."

Studies have shown that the nature and frequency of relationships with primary kin are very much affected by ethnicity, and age (cf. Litwak and Szelenyi, 1969:465; Sussman and Burchinal, 1968; 1962). In general, Anglo-American elderly are relatively more socially isolated (Bennett, 1973:179), and exhibit greater variation in income and wealth accumulation than minority elderly (Terrell, 1971:363). Aged Blacks, in contrast, tend to be more uniformly poor but are also more actively involved in kin network (cf. Jackson, 1971; Kent, 1971; Babchuk and Ballweg, 1971). Jackson (1972:271) in a study of southern Black grandparents concludes that "these findings help to debunk myth of... the disintegrating or ephemeral kinship ties between aged and aging Blacks... they indicate that many Black grandparents serve as a point of anchorage for grandchildren and provide kinds of support for them unavailable from their own parents." Perry and Perry (1959:45–59) have also commented on the greater cohesion among relatives in Black as opposed to White communities facing disaster. Elderly American Indians, perhaps even more than Blacks, tend to fall into low income brackets and be deeply involved with the extended family (Taylor and Peach, 1974:154).

Finally, it should be pointed out that age and ethnicity have a direct impact on warning response, in addition to the indirect relationship through kinship described above. McLuckie (1970:38) indicates that "different classes or ethnic groups have varying conceptions of what constitutes adaptation to a threat, or credibility of community organizations which might be involved in issuing warning messages." Hence, what might be perceived as appropriate protective behavior by Blacks or Indians may not at all be related to the adaptive behavior promoted by some official agency in its warning message. It is also known that aged people in general respond less enthusiastically to disaster warning and calls for evacuation (Friedsam, 1962:155–157). Studies of English evacuation during World War II indicate that even as the bombs were falling some aged citizens still refused to be evacuated (Titmuss, 1950:451; Ikle, 1951:135).

#### **Community involvement**

Community involvement refers to the individual's patterns of interaction with friends (neighbors), and his participation in voluntary associations and other community organizations. Barton (1970:63–124) has pointed out that the extent of people's integration into the community affects the content, source, and number of warnings received in much the same way as kin relationships. The greater one's social contacts, the more likely one is to receive more information regarding a potential hazard. It is generally agreed that when both kin and community contacts are available, kin relationships are more important in evacuation decision making (Drabek and Boggs, 1968). The reason for including community involvement, however, is that when kin bonds are weak or absent, ties to the community can serve a similar function as far as a model of evacuation behavior is concerned.

As with kin relationships, community involvement varies with age and ethnicity. Blacks, in particular, are cited as relatively more involved in voluntary and formal organizations than Whites or other minority groups (Babchuck and Thompson, 1962; Oram, 1966; Renzi, 1968). Tomeh (1973:99) points out that, with respect to membership in voluntary associations, "studies... show higher participation rates for Blacks at all social class levels, especially lower class." Previous research which did not control for social class erroneously reported Black participation rates lower than White rates (Wright and Hyman, 1966:32).

Although it is generally argued that social isolation – shrinking friendship networks and decreased affiliations with organizations (Watson and Maxwell, 1977:59–66) – characterizes most aged people, it has recently been acknowledged that the variance along this dimension is greater than previously believed" (Cottrell, 1974:49–57). Broadly defined, however, community involvement tends to decline with increasing age of the head of household (Harry, 1970).

#### **SUMMARY OF THE DETERMINANTS OF EVACUATION**

Based upon the literature review presented above, one can begin to sort out and order research findings, and summarize the data which bear upon the important dimensions derived from a systems-emergent norm framework for warning response. The most important function of this review is that it provides information on empirical findings which allow one to construct (inductively) images of causal order and to infer possible relationships among variables. As Blalock (1969:8) points out such inductive reasoning combined with information deduced from theoretical frameworks, represents the initial step in the development of causal theory.

Based upon information from the review of the empirical literature, one can define a series of hypotheses which identify factors important in evacuation and specify the interrelationships among these factors. The identification of factors (variables) to be interrelated is based upon theoretical considerations – that is, important issues derived from an emergent norm-system perspective – and existing empirical evidence – that is, research-based data regarding the relationship between each factor and the target adaptive response of evacuation. Each numbered statement characterizes the hypothesized relationship of a major variable to evacuation; sub-statements specify the relationship between a major variable and variables antecedent to it.

1. The more precise the individual's adaptive plan, the higher the probability of evacuation.
  - 1a. Recent prior experience with disaster impact increases the chance that an individual will have a precise adaptive plan.
  - 1b. The more detailed the warning message, the more likely it is to provide an adaptive plan.
2. The greater the individual's perception of real threat (warning belief), the greater the probability of evacuation.
  - 2a. The more recent the individual's prior experience with disaster, the more likely he is to perceive the threat as real.
  - 2b. The more precise the warning message the greater the chance that the individual will perceive the threat as real.
  - 2c. As the number of warnings received increases, so does the degree to which the threat is perceived as real.
  - 2d. Receipt of a warning from a credible source (or confirmation by a credible source) increases the degree to which the threat is perceived as real.
3. The higher the level of perceived personal

- risk, the greater the probability of evacuation.
- 3a. Recent prior experience with disaster is positively related to the level of perceived personal risk.
  - 3b. To the extent that the warning message specifies the location of impact, level of perceived personal risk for persons within the impact area will increase.
  - 3c. To the extent that the warning message specifies that disaster impact will be severe, persons within the projected impact area will experience increased levels of perceived risk.
4. To the extent that family (household) members are together or accounted for, the probability of evacuation is increased.
  5. The closer one's relationship to extended kinsmen, the more likely one is to evacuate.
    - 5a. The closer one's relationship to extended kinsmen, the more likely one is to receive additional warning information through these contacts.
    - 5b. The closer one's relationship to extended kinsmen, the greater the number of potential credible sources for warning information.
    - 5c. The closer one's relationship to extended kinsmen, the more warnings the individual will receive from these contacts.
  6. The greater one's participation in the community, the more likely he is to evacuate.
    - 6a. The greater one's participation in the community, the more likely one is to receive additional warning information from these contacts.
    - 6b. The greater one's participation in the community, the greater the number of potential credible sources for warning information.
    - 6c. The greater one's participation in the community, the more warnings the individual will receive from these contacts.
  7. Families headed by aged persons, or extended family households containing aged, are less likely to evacuate in response to hazard warnings.
    - 7a. As age increases, the frequency of contacts with kinsmen decreases.
    - 7b. As age increases, the level of community participation decreases.
    - 7c. In general, with other factors constant, as age increases, the number of warnings received decreases.
  8. Cultural factors (race/ethnicity) influence the extent to which a family is likely to evacuate.
    - 8a. Cultural factors (race/ethnicity) play an important role in defining appropriate patterns of interaction with kinsmen.
    - 8b. Cultural factors (race/ethnicity) play an important role in defining the ways in which the family relates to the community.
    - 8c. Cultural factors (race/ethnicity) play an important role in definition of family role responsibilities.
- The above statements summarize empirical findings from studies of individuals' response to warnings as they relate to the problem of evacuation. The assumed causal order implied in the propositions reflects four basic theoretical assumptions resulting from the adoption of an emergent norm perspective. First, it is assumed that the warning itself serves as a stimulus to individuals which requires (or suggests) that an environmental change is pending and some restructuring of the situation is necessary. Second, it is acknowledged that social restructuring takes the form of several "milling processes" wherein assessments are made of the extent to which the threat is real and the level of personal risk involved. Third, this restructuring involves the collection of information which may be drawn from the warning message, the source of the warning, and one's prior experiences under similar cir-

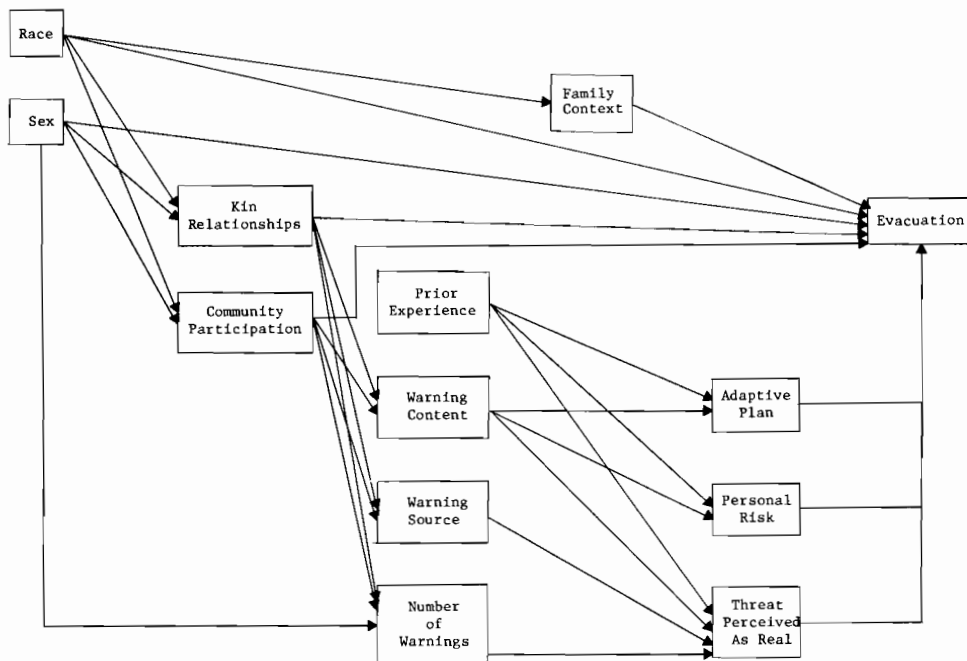


Fig. 2. Diagram of variables important in individual decisions to evacuate (arrows represent relationships, either direct or indirect).

cumstances as well as kin or community contacts. Finally, it is acknowledged that certain characteristics of the individual (e.g., family role responsibilities, kin relationships, community development, age, race/ethnicity) must be taken into account as factors which affect either directly or indirectly the outcome of the posited milling process (this outcome being evacuation).

The relationships specified above are graphed in Fig. 2. This conceptual framework represents a sketch of the interrelationships among factors believed to be important in individual decisions to evacuate in the face of natural disaster. The value of this framework lies in the fact that it is an explicit attempt to integrate existing research findings along explicit theoretical lines. As such, the hypotheses highlight important variables, conditions and relationships which should be given careful scrutiny when addressing the problem of understanding people's decision-making processes relative to evacuation warnings.

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