5. PUBLIC RESPONSE ASPECTS OF WARNING SYSTEMS

Social science research on public response to warnings of impending disaster began in the 1950s as part of the research program in the National Academy of Sciences (NAS). These investigations examined human response to both natural and technological emergencies. Research continued in the 1960s by individual researchers. In the 1970s and 1980s, warning response studies placed less emphasis on describing human response and focused on discovering how single factors (like sex or age) covaried with public behavior. Most current studies attempt to model the effect of complex sets of factors and their interactions on warning response. Consequently, existing empirical studies vary widely in terms of methodological soundness, theoretical quality, the hazard type being studied, the type of public behavior being studied, and in the basic reasons for conducting the study.

In this section, we synthesize what is known based on the record of empirical research on public warning response. We begin by describing our conceptualization of the social-psychological process that people go through in a warning situation from the time a first warning is heard to the time people respond. The second part of this section defines the factors documented by research as the reasons people think and do different things in response to warnings. The third part summarizes how these factors impact the warning response process (also see Appendix B). The final part of the section summarizes how to use knowledge about public response in designing and implementing a warning system.

5.1 THE WARNING RESPONSE PROCESS

Why can different perceptions of risk arise among the members of a public who all receive the same warning message? Why can public response to a warning differ between individuals who all receive the same information about how to respond? In this section, we outline the basic social-psychological process that underlies these differences.

Human decision making about warnings resembles an ordered-choice or lexicographic decision process. People go through a more or less sequential process in which they consider various aspects of the decision confronting them before acting. The sequence may not be the same for every person warned. Moreover, each stage is not necessary for a response to occur. The process is initiated by notification or hearing an initial warning. This, in turn, leads to various psychological and behavioral outcomes, and the process is shaped by sender (those issuing the warning) and receiver (those hearing the warning) factors.

5.1.1 Hearing

The first stage is hearing the alert or warning. It cannot be assumed that just because a warning is broadcast or a siren is sounded people will hear it. Even when it is physically possible to receive the warning, the warning may, so to speak, fall on deaf ears. People may fail to hear because of habituation (e.g., they never really listen to television), selective perception (e.g., they hear only what they want to), or physical constraints (e.g., they are out of range of the siren system). Regardless of the reason, the failure to hear a warning generally precludes or at least delays response.

5.1.2 Understanding

Once heard, the warning must be understood. Understanding does not refer to correct interpretation of what is heard, but rather to the personal attachment of meaning to the message. Meaning or understanding can vary between different people, and these varied understandings may or may not conform to the meaning intended by those who issued the warning. For example, one person may understand a flood warning as a high wall of inundating water while another may conceive of ankle-high runoff. Ashfall may be construed as a suffocating, blanketing coverage, or as a light dusting of powder. A 50% probability may be interpreted as certainty by some or unlikely by others. In this sense, understanding also defines and bounds perception of risk and what to do about it.

5.1.3 Believing

Once an understanding is formed, people then determine whether or not to believe that the warning is real and that the contents of the message are accurate. Believability is influenced by many factors associated with the method and contents of the warning. The classic referenced case is the "cry wolf" syndrome. If warned often and falsely, people, it is feared, will not believe a true warning. While this may be a legitimate concern in some cases, it has not been proven to be true for warnings in general.

5.1.4 Personalizing

People think of warnings in personal terms—that is, in terms of the implications of the risk for themselves, their families, or their group. If people do not feel that they are the targets of the warning (even though it may be understood and believed), they may well ignore it. This is illustrated by the "it can't happen to me" syndrome, in which people deny the existence of a risk for which they have been warned. Personalizing a warning is an important step that facilitates a response to the warning.

5.1.5 Deciding and Responding

At this stage a person has heard the warning, formed an understanding about what was heard, developed a level of belief about what was understood, and decided whether or not he or she will be personally affected by the risk when it materializes. The next step in the process is to decide what if anything to do about the risk. In general, people do what they think is best for them to do. This is sometimes interpreted as irrational behavior by an observing expert, but it is in fact typically rational for the person engaged in the response. Moreover, making a response decision does not automatically lead to acting on that decision, since events may prevent intended behavior from occurring. For example, a family may decide to evacuate, but a missing pet may delay or prevent the relocation.

5.1.6 Confirming

A person typically goes through the stages of the model just outlined each time new warning information is received. Thus, response is not the result of a single decision but is instead the eventual consequence of a series of decisions. Additionally, during the emergency warning period people do not passively await the arrival of more information. Instead, most people actively seek out additional information. Seeking new information to confirm prior information, or receiving new information which confirms prior information, has typically been referred to as the warning confirmation process. When warning information is received, most people try to verify what they heard by seeking out information in another warning message or from another warning source or person. Confirmation is the main reason that telephone lines can become busy after a public emergency warning is issued; people call friends and relatives to get their interpretations of the event and to find out what they are going to do.

The confirmation process occurs because people are information hungry following receipt of warnings. Rarely are people overwhelmed by information in a warning context. Instead, there is an information void caused by uncertainty, particularly when rare or unfamiliar events are about to occur. This void typically creates a public demand for more information than is being disseminated in the warning message. In addition, it creates a need for repetitive warning messages to enable people to absorb all the knowledge they wish to possess.

Confirmation plays an important role in the general warning response process. It is ongoing and affects each stage in the process. It helps people better understand warnings, believe them, personalize the risk, and make response decisions.

5.2 THE FACTORS THAT AFFECT THE WARNING RESPONSE PROCESS

Research findings suggest that variation in the warning response process occurs for a variety of reasons. All of these reasons focus upon differences in the warnings themselves as well as between members of the public who receive warnings. We refer to the former as sender determinants because they deal with aspects of the actual warnings sent to a public (e.g., frequency of repetition and named source). We refer to the latter as receiver determinants because they describe the ways that members of the public can differ one from another (e.g., sex, age, and prior disaster experience). It is our intent to define these sender and receiver factors.

5.2.1 Sender Factors

We have defined only those sender factors that research has demonstrated as having an impact on the warning response process. These sender factors have been grouped into four categories (Fig. 5.1). These categories are attributes of (1) the warning messages themselves, (2) the channels through which the messages are given, (3) the frequency with which messages are given, and (4) the persons or organizations who are the sources of the warning messages.

MESSAGE ATTRIBUTES
Content (location, guidance, risk time, source)
Style (specificity, accuracy, consistency, certainty, clarity)
CHANNEL ATTRIBUTES
Type
Number
FREQUENCY ATTRIBUTES
Number
Pattern
SOURCE ATTRIBUTES
Officialness
Credibility
Familiarity

Fig. 5.1. Tyopology of sender characteristics.

Message attributes deal with both message content and message style. Message content consists of four components: (1) information about the location(s) at risk and not at risk; (2) information about the character of risk, for example, the depth of expected flood waters; (3) information about guidance, or what people should do to protect themselves; and (4) information about how much time there is before impact or before a protective action should be initiated or completed. The style of a warning message has five components: (1) specificity, or the degree to which the message is specific about risk, guidance, location, and time; (2) consistency, or the degree to which the information in a message or across different messages is consistent and not contradictory; (3) accuracy, or the extent to which message content is correct; (4) certainty, or the degree to which those giving the warning message seem certain about what they are saying; and (5) clarity, or the extent to which information is stated clearly and in words which people can understand.

Attributes of the channels through which warning messages are disseminated refers to the actual medium used to transmit a message, whether television, radio, route notification, face-to-face communication, or others (Fig. 5.1). Channel number simply refers to the number of different warning channels used to get the word out.

The frequency with which warning messages are disseminated is divided into two characteristics. First is the number of times a particular warning is repeated or conveyed to the public. Second is the degree to which message repetitions occur in a predictable pattern, for example, every 15 min, randomly, or not at all.

The last category of sender factors is source attributes, which refers to the person or organization disseminating the warning message. Three factors have been demonstrated as being important: (1) the level of familiarity of those giving the message to those receiving it; (2) the degree to which the message giver is perceived to be an official source; and (3) the perceived credibility level of the message giver.

5.2.2 Receiver Factors

The many factors relating to the characteristics of the people who receive warnings have been grouped into the following four categories (Fig. 5.2): environmental, social, psychological, and physiological.

ENVIRONMENTAL ATTRIBUTES
Cues (physical, social)
Proximity (distance, time)
SOCIAL ATTRIBUTES
Network (family and community)
Resources (physical, social, economic)
Role (age, gender, responsibility, status)
Culture (ethnicity, language)
Activity (sleeping, working, engaging in recreation)
PSYCHOLOGICAL ATTRIBUTES
Knowledge (hazard, protective action, plans)
Cognitions (stress, fatalism)
Experience (type, recency)
PHYSIOLOGICAL ATTRIBUTES
Disabilities

Fig. 5.2. Tyopology of receiver characteristics.

Environmental factors are largely those cues which either do or do not support the warning information that has been received. Cues can be physical; for example, it is raining heavily when flood warnings are received. Cues can also be social; for example, neighbors are seen evacuating when evacuation warnings are received.

The social attributes of the warning receiver have been grouped into five categories:

1. Aspects of the social network of which the warning recipient is a member. This category includes such factors as whether or not the family is united when the warning is heard, social ties and bonds, or the existence of nearby friends and relatives.
2. Resource characteristics of the warning recipient. This category refers to physical resources, such as having or not having access to a car in which to evacuate; economic resources, such as having or not having the money to pay for a hotel; and social resources, such as having or not having a local social support system of friends, church, or community groups.
3. Aspects of the role of the warning recipient, such as sex and age and being a parent.
4. Cultural characteristics, such as ethnicity, and language.
5. Activity characteristics of the warning recipient. Response can vary depending on whether the receiver is sleeping, working, or participating in recreational activities.

The third set of attributes of the warning recipient relates to psychological characteristics. These include knowledge about the risk associated with a particular hazard agent, about protective actions, and about the existence of emergency plans; cognitions such as psychosocial stress level and sense of personal efficiency of the warning recipient; and previous experience with the hazard agent.

Finally, there are physiological attributes. Physical disabilities such as deafness and blindness can affect the warning process; disabilities such as mobility impairment can affect warning response.

5.3 A SUMMARY OF RESEARCH FINDINGS

In Sect. 5.3, we summarize research findings on how sender and receiver factors affect the hearing, understanding, believing, personalizing, deciding, responding, and confirming elements of the warning response process. (The actual findings from specific research studies are catalogued and referenced in Appendix B).

5.3.1 Hearing Warnings

Relatively few empirical findings exist in the research literature on why some members of the public hear warnings of impending disaster while others do not. It is possible that few researchers have thought to study this factor because many assume that a warning is heard. Enough evidence exists, however, to conclude that it would be imprudent to presume that all members of a public would hear a warning just because one is issued. In addition, research evidence does exist to document that hearing a warning is influenced by both sender and receiver factors.

5.3.1.1 Sender Factors

The information channel used for disseminating emergency public warnings has a clear effect on the number of people in an endangered public who hear the warning. The mass media is typically the most effective, and the broadcast media have been the primary source of hearing warnings among all available types. Some studies found that television is more effective than radio; however, an equal number of studies found the opposite. It has been found that the electronic mass media are more effective initially, but that newspapers become a more important source in the case of long-term warnings that extend over several days or weeks. It has also been documented that personal contact with the public can be an effective way to increase the number of people who hear a warning. In all cases, the more that different information channels are used to disseminate warning messages, the more people who hear and remember that they have heard a warning message.

The findings on the effect of sender determinants on enhancing the hearing of warnings by an endangered public are relatively scant compared to other topical areas in public warning response research. The empirical base is also limited in the sense that findings rest largely on simple statistical analyses in single case studies, rather than on hypothesis-testing studies. Nevertheless, evidence in the research record suggests that the number of people who hear a warning message can be maximized if multiple electronic mass media channels (radio and television) are used to issue a public warning, supplemented by personal contacts with the public and by the use of the printed mass media (i.e., newspapers) in the case of long-term warnings.

5.3.1.2 Receiver Factors

The research available on the effect of receiver factors on the probability of a member of the public hearing an emergency warning suggests three findings.

First, some members of society are more likely to hear a warning because they are part of a social network (association member, community system, kinship network, subculture) or are in a social role (higher socioeconomic stratum, young, female, parents) that leads them to have more links to other community members who might give them informal warning notification. Even these people, however, have a lesser chance of hearing a warning when removed from access to their social networks, for example, when they are engaged in activities away from home or work. Informal notification is also less likely, and consequently hearing a warning is less likely, for people not in close proximity to a potential disaster site since their social networks would probably contain fewer contacts with people who already have received a warning.

Second, some people are less likely to hear a warning because they are less quick to pick up on the cues around them or make interpretations that would lead them to seek out a warning. Such people, for example, would be those without environmental cues; those without disaster experience, knowledge, or a contact who knows about the hazards; and those that have fatalistic cognitions.

Third, there are some people with physiological constraints to hearing a warning. The physical impairments of the deaf and blind could delay from their receipt of a warning. In practice, however, such impairments may not retard receipt of a warning. Friends, neighbors, relatives, and other intimates may give informal notification.

These findings suggest that the number of people in a public who receive a warning can be maximized in theory by (1) planning to capitalize on the natural tendency for

informal notification to carry warning messages to others; (2) providing cues (e.g., the use of sirens) which very few could ignore; and (3) planning to overcome the physiological constraints that could keep some from hearing a warning.

5.3.2 Understanding, Believing, Personalizing, and Responding to Warnings

Research findings document that warnings are more likely believed if they are based on a clear understanding; warnings are more accurately personalized if they are understood and believed; and warnings are more likely to be responded to with some protective action if they are understood, believed and personalized. These findings suggest that each of these social-psychological factors are important in understanding and predicting public warning response. Interestingly, and for all practical purposes, the sender and receiver factors which impact each of these warning response process factors are almost identical.

5.3.2.1 Sender Factors

The research record points out the characteristics of warnings that maximize the probability that they will be correctly understood, believed, personalized and acted upon. The most effective warnings are those which are specific about impact location, protective actions, the time to impact, and the character of risk. Also, they are consistent and certain, they address why they should be acted on if the probability of impact is not very high, they are delivered through multiple channels of communication, they are often repeated, and they are labeled as coming from a panel of officials, scientists, and experts to enhance the credibility of the information in the warning. No single warning source is credible for everyone. Warning information that is inconsistent, vague and unclear result in a confused public and misunderstandings about what to do, why, and when.

Also, it is typical for any warning situation to be characterized by different and inconsistent warnings form a range of sources, for example, official warnings versus informal ones from neighbors. Official and frequently repeated warnings can help people focus on authoritative messages rather than on warning from other nonofficial sources. Frequent repetition also increases the odds that warnings will offer consistent rather than inconsistent information.

5.3.2.2 Receiver Factors

The evidence provided by research studies suggests that there are differences among the people who receive warnings that impact warning understanding, belief, personalization and subsequent response.

First, some members of the public are better equipped to process and respond to warnings because of pre-emergency knowledge about the hazard and appropriate response, education, socioeconomic status, experience, resources to facilitate response, and the lack of physiological constraints.

Second, some people are in positions that act as incentives to process and respond to warnings. These include being in positions of responsibility for others, observing environmental or social cues that confirm the risk or response, having a perception of personal risk because of close proximity to the impact area and therefore access to less distorted information, and access to a social network like friends and family to talk to and enhance response options like evacuation.

Third, some people are in positions or of a character that act as constraints to processing warning information and to response. These include, for example, the tendency to follow habit, membership in minority subcultures that distrust main-culture authority, a general tendency to prefer to engage in some protective actions as a united nuclear family, and having fatalistic cognitions.

These findings do not mean that members of the public who fit a profile that would predispose them to poor warning response must be destined to such an outcome. They do suggest that sender attributes of warnings are more important in facilitating good public perceptions and response among some members of the public than among others, for example, people with little education, those who do not see environmental cues, and those who are members of a minority group subculture. Warning response as illustrated in historical emergencies suggests that some people process emergency warning information well, while others do not, simply because of who they are. This underscores the need for warning plans that address sender factors to give all members of the public an equal or good chance to interpret and respond well to warnings in an emergency.

5.3.3 Confirming Warnings

Confirmation of a warning is a typical public response to receipt of a warning message. It affects eventual protective action response by enhancing the understanding of, belief in, and personalization of original warnings. Research indicates that confirmation is a positive function of lead time, perceived personal risk, messages received from the mass media, and family unity. It is a negative function of the number of warning messages received (which is itself confirmation), prior knowledge about the hazard, and the level of specificity contained in the original warning received. It seems, therefore, that confirmation attempts are most likely when the original warnings are not repeated (or not repeated often enough) and lack details. It is apparently difficult for the public to perceive risk and act on the basis of limited initial warnings. People seek out and need additional information to be convinced that they should engage in protective action.

5.4 USING RESEARCH KNOWLEDGE

Studies over the last several decades have addressed public warning response in a wide variety of climatological, geological, and technological events. Research has been of varied types. Some studies have been descriptive, while others tested hypotheses. Some have used sophisticated multivariate analysis, while most have instead been content to explore the character of a few hypotheses based on simple statistical tests of correlation and significance. Despite a rich variety in method, approach, and analysis technique, the accumulated database can be cataloged, as we have sought to do in the preceding parts of this section and in Appendix B. These data can then be viewed at a higher level of abstraction to answer the question, "what operates to determine public response to warnings of impending disasters?" It is the purpose of the concluding part of this section to summarize and theorize about public response to warnings. We also comment on what these conclusions suggest for planners of emergency public warning systems.

5.4.1 The Nonbehavioral Aspects of Response

People respond to warnings through a social and psychological process; to comprehend warning response means to understand that process. Planning for a sound

public response to a possible future emergency means that this social and psychological process must be addressed.

The process follows: (1) the odds of good public response are enhanced if warnings are personalized by those who should personalize them and not personalized by those who are not at risk; (2) the probability of effective warning personalization increases as a direct function of the level of belief elicited by emergency warnings; (3) belief in emergency warnings can have its best effect on personalization if it is preceded by accurate public understanding of what is being said in a warning; and (4) understanding the contents of a warning presumes that warnings are heard by the public.

Our first general conclusion, therefore, is that public warning response is best understood, and planned for if it is viewed as a series of related sequential factors which are hearing warnings, understanding what is said, believing what is heard, personalizing what is believed as may be appropriate, and then engaging in response behavior. Of course, the process we outline does not always function this way in the real world. For example, it is possible in any evacuation to find evacuees who did not personalize a warning, did not believe that the disaster would impact the area, or even did not understand what was going on. Consider a teenager who evacuated only because it was a chance to cut school and party with friends in another town or the older woman who evacuated only because her daughter insisted that she do so. Usually, however, the process we outline above will help explain most of the behavior that occurs in response to warnings.

5.4.2 Response Process Determinants: An Overview of What Is Known and Its Implications

In an endangered population, random chance does not determine who does and does not hear, understand, believe, personalize, and respond to emergency warnings. These sequential steps in the warning response process are the consequences of the effects of the factors that we have already grouped together into the categories of receiver and sender determinants. The following general conclusions we are able to reach regarding these factors are based on our review of the empirical record.

First, different members of a population belong to different communication networks and have access to different communication linkages to the outside world. Consequently, the number of people who hear a warning can be maximized by disseminating warning messages over the full range of public communication networks.

Second, the understand-believe-personalize-respond stages of the response process all appear to be facilitated by providing emergency information that is both convincing and reasonable from the public's point of view. The empirical record documents well what does and does not constitute reasonable and convincing emergency warning information from the public's viewpoint. As we have already seen, warnings are perceived by the public to be convincing and reasonable if they are specific, consistent, accurate, certain, and clear as to the location of the area of risk, guidance about what the public should do, the character of the hazard, and the amount of time until its impact. Changes in the content of warnings that would make them appear inconsistent with other warnings should be explained; uncertainty regarding, for example, the probability of impact, should be explained, and why the public should act upon uncertain information as if it were certain should also be explained. Warnings should also be repeated frequently; it is insufficient to issue a warning once or so infrequently as not to provide the public a chance to hear the warning multiple times. Additionally, warnings are most effective if they come from a

source that maximizes the credibility of the warning information. Who is credible for one person, however, may not be a credible source for another. Credibility can also change over time. Therefore, it seems important that warnings stem from a mix of sources or a panel. This panel could include, for example, scientists, officials, a familiar local personality, and a familiar disaster response group such as the Red Cross. Credibility of warning information is also enhanced by the confirmation process and the frequency with which a particular warning message is heard.

Third, even when warnings meet all these standards they cannot produce convincing and reasonable emergency information for each and every member of a public. People have inherently different perceptions of fact and circumstance which they bring to an emergency warning response setting, and which almost predispose them to different responses. In fact, different researchers have found a multitude of factors that correlate with variation in warning process outcomes, including age, sex, length of community residence, locus of control, experience, proximity to impact area, education, environmental cues, seeing neighbors evacuating, and stress, to name but a few. But these factors, in our view, are a multitude of different indicators of the same more general concepts, and these general concepts provide an avenue for understanding how public differences of fact and circumstance can predispose variation in warning response.

Four concepts can explain and organize the empirical record regarding the effect of receiver determinants on warning response process outcomes. These are (1) variation in the ability to process risk information; (2) access to social and physical networks and events that would facilitate desirable warning response process outcomes; (3) incentives to be vigilant, take a warning seriously, or err on the side of caution; and (4) constraints to desirable warning response process outcomes.

People vary in their ability to process the risk information contained in a warning of an impending disaster. Variability exists because of differences between people, such as level of education, cognitive abilities, pre-emergency knowledge about a particular hazard, experience or lack of it with a particular hazard, and the degree of fatalism with which they approach life. Variability also exists because of situational circumstances characterizing a warning event. It is easier for people to impute meaning to risk information when their environment provides cues supporting the content of the warning information, for example, heavy rain in the context of flood warnings, sirens in the event of an invisible radiological emergency, and seeing neighbors evacuating or patrol cars issuing warnings as people contemplate whether or not they are at risk. Human variation in the ability to process risk information, for both factual or circumstantial reasons, can lead to variation in warning response.

People also differ in terms of the access they have to social and geographical networks and events. These differences can also lead to differences in warning response process outcomes. A range of social-network attributes can make a difference in response process outcomes. For example, persons who are part of large and well-established social networks and friendship groups are more likely to receive informal warnings. Consequently, they are more likely to confirm warnings, as well as understand, believe, and personalize warnings, and engage in response. Social-network membership also enhances the odds that people have someone to talk to as they seek to define the warning situation and arrive at a meaning for it. Network membership also increases options for warning response—for example, having the home of a friend or relative to evacuate to, or receiving an invitation to do so. Persons who are not at home when they receive a warning are denied at least partial access to their networks and have a lower probability of responding appropriately.

Geographical proximity to the area at risk can also affect process outcomes. The further away one is from the area, the more distorted the emergency information one has access to and the less informed the warning response decisions. Human variation in network access, either by permanent or circumstantial differences, will lead to variation in warning response process outcomes.

People who receive warnings also differ in terms of factors which act either as incentives or as constraints to sound responses. Some people have more of an incentive to be vigilant, take a warning seriously, investigate what is happening and confirm a warning, or to err on the side of caution. Others simply lack some or all of these incentives. Incentives can exist for a variety of reasons, such as being in a role of responsibility for children, being socialized into a protective or nurturing role like that of a parent, or being predisposed to perceive risk in one way or another as regards a particular hazard. Incentives can also be circumstantial—for example, having only a very short time until impact and not being afforded the luxury of being able to socially negotiate the meaning of a warning.

Some people, again by virtue of factual or circumstantial differences, can be constrained from sound warning understanding, belief, personalization, and response. Constraints include lacking the resources necessary to act (not having a car in which to evacuate), being unable to engage in some actions for physiological reasons, belonging to an ethnic group which sometimes distrusts the information that comes from the mainstream, being of a psychological state that precludes sound judgment (being particularly stressed, being elderly enough to not be open to the occurrence of low-probability disastrous events, ascribing to unfounded fears like the fear of looting), or simply being unwilling to engage in any action until assured of the safety of a loved one or other intimates.

In conclusion, receiver characteristics vary widely among members of a public in any one warning circumstance, as well as between different events. In warning events that provide convincing and reasonable emergency warning information to the public, the understanding, belief, personalization, and response of the public can be sound. The effect of receiver determinants on warning process outcomes are not unchangeable laws of nature. It is possible to design a warning system with sender characteristics that maximize the probability of sound public response, and it is also possible to minimize the negative impacts of receiver characteristics. These goals can be achieved by a range of planning alternatives, with the specific planning elements to achieve the goals varying from hazard to hazard and across entities. The basic principles and planning goals, however, should be the same across hazards and planning entities.

5.4.3 The Confirmation Process

Our third major conclusion regarding public response to warnings is that confirmation of warnings underlies the entire warning response process. The notion is straightforward and important. Regardless of the widespread popular myths in American society to the contrary, people are a hearty lot and are not easily convinced that the unthinkable (a disaster) can happen. Many public emergency managers are willing to express concern that the public will panic when faced with news of an impending catastrophe. Many others presume that issuing a warning will immediately be followed by prudent public action in response to hearing the message. Still others speculate on the basis of misinterpreted evidence that warnings for some types of impending disaster will elicit dramatic and immediate public flight (e.g., fleeing American cities on the heels of

initial notifications of an impending nuclear attack or a radiological emergency at a nuclear power plant).

In fact, the accumulated evidence strongly suggests that the first response (and perhaps even the second and third response) of most people to receiving a warning message is to seek to confirm that message, to get more information, to talk over the warning with others, and to hear the same message again. Confirmation of warning messages is necessary for most people before they act in ways that go beyond seeking confirmatory information.

The need to confirm warning information declines as a function of receiving well-planned warnings in the first place, for example, warnings that are specific and frequently repeated. Emergency planners would do well to recognize and provide for public warning confirmation rather than leave it to chance.

5.4.4 A General Model

The research record suggests a model, presumed to depict cause and effect, which summarizes the determinants and consequences of public response to warnings of impending disasters. Figure 5.3 is our attempt to construct such a model informed by the empirical record discussed earlier in this section and in Appendix B. The boxes in the model represent the factors which have already been discussed in detail, and the arrows represent cause and effect between the factors. It seems quite reasonable to conclude that the effect of receiver factors in the model can be reduced as the sender factors escalate in quality in any given emergency.

The model presented in Fig. 5.3 is best viewed as one in need of future empirical test. It does well represent, and then hypothesize, the character of cause and effect suggested by the empirical record. It was, obviously, induced from the existing data. To the best of our knowledge no single research effort has sought to measure each factor or concept in the model systematically and analyze the entire system in a multivariate format. Therefore, although it is possible to hypothesize the model on the basis of empirical studies, it is impossible to conclude it to be scientific fact.

5.4.5 Specialized Topics

The substance of this section has been focused upon response of the general public to warnings. We have not addressed specialized topics. It is the purpose of Sect. 5.4.5 to review a few of the most important special topics and activities regarding public warnings.

5.4.5.1 Alerting Special Populations

Some segments of a population require special warnings simply by virtue of their unique character. These population segments include those in special facilities such as schools, prisons, old-age homes, hospitals, and other institutions. The warnings required by such institutions are probably not different from the sort provided the general public. However, it is likely that such facilities would require more time for warning response than would be required by members of the general public. Consequently, it would be useful if means were provided to specially communicate warnings to such facilities, as, for example, over tone-alert radios or dedicated phone lines.

Special populations with unique warning needs can also exist in noninstitutionalized settings. For example, the elderly may occupy a particular geographical region of town.

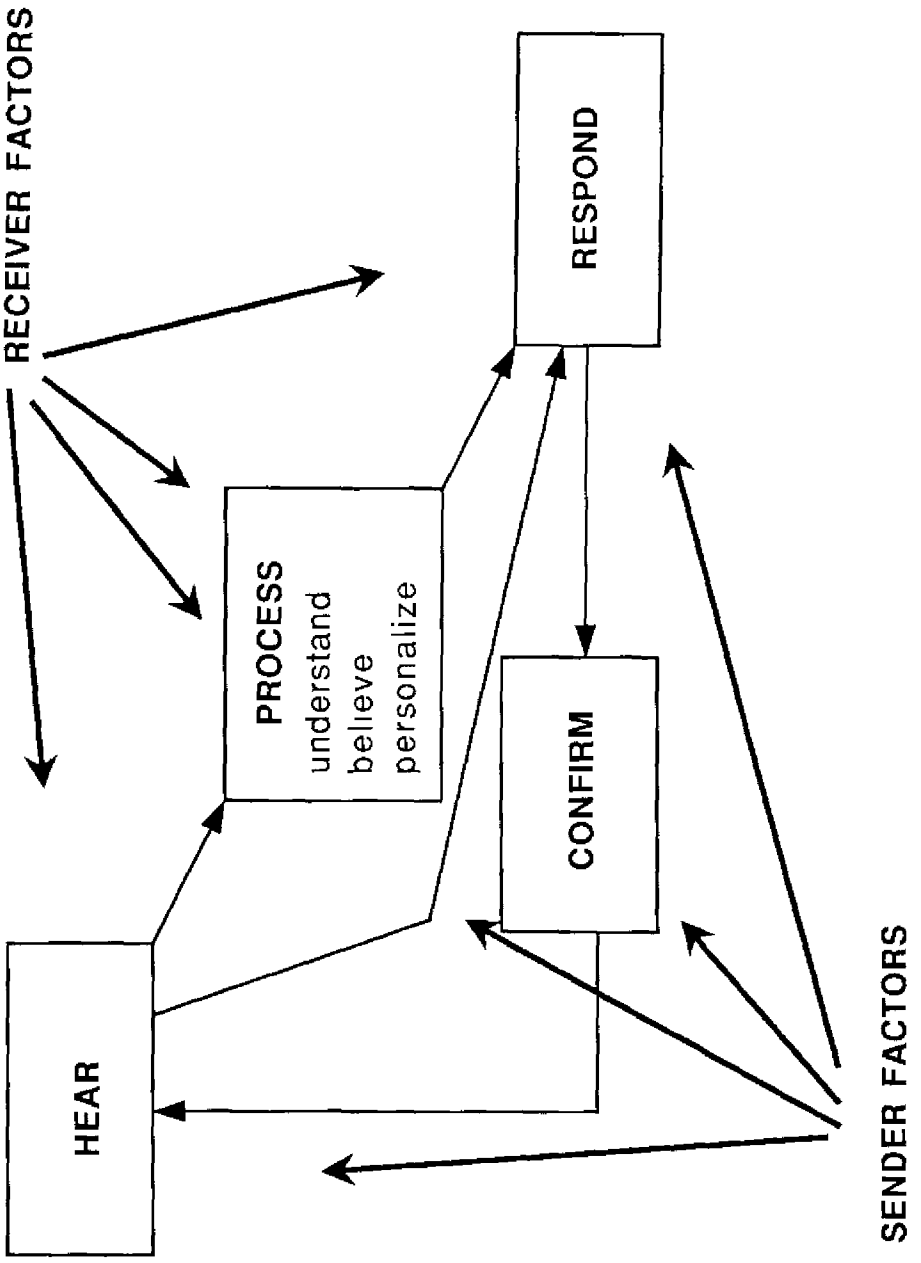

Fig. 53. A model for the determinants and consequences of public warning response.

Since older people require a larger effort to convince them to engage in protective actions such as evacuation, special warnings should be provided for their neighborhood (i.e., route notification or through the frequent repetition of media warnings).

5.4.5.2 Public Education

Research documents that pre-emergency knowledge in a public enhances response to warnings. This knowledge can be gained in a variety of ways, for example, through disaster experience. Research on pre-emergency hazards education which has examined the effect of brochures, mailers, and other educational devices has produced mixed results regarding effectiveness. Some studies do report a positive effect; other found the effect to be negative, while other studies found that pre-emergency education attempts had no effect. At present, there is inconsistent evidence that pre-emergency education has a positive affect on warning response. One should not interpret this to mean that education is not worthwhile. It is unclear if inconsistent findings result from poor design of educational efforts being studied or inadequate research methods. Nevertheless, we do know that knowledge regarding a hazard, appropriate protective actions in response to hazard warnings, and the character of existing warnings systems are the major topics which should be covered by public education.

5.4.5.3 Response Anomalies

There may always be response anomalies regardless of the quality of warnings issued to the public. For example, there may always be a few members of a public who simply refuse to engage in protective actions. The well-publicized case of Harry Truman during the eruption of Mount St. Helens is illustrative. Mr. Truman received warnings and believed that the volcano would erupt. He simply refused to evacuate. No warning system can be 100% effective because some few people may refuse to heed the advice in warnings regardless of their character. In a free society, there will never be a way to avoid response anomalies such as these.

5.4.6 An Application Goal

The 1989 Hurricane Hugo provides an example of the general application goal for using findings from pubic response research effectively. This was one of the largest storms to ever hit the United States. Several states and territories were impacted, and different populations engaged in different protective actions. For example, thousands of people evacuated, thousands of others sheltered in their homes, and thousands did nothing. For the most part, each different population made the correct response. It is likely that each did so based on accurate alternative perceptions of risk, and these were quite heterogeneous across the affected multistate area. The reason for this success was that a multitude of different warning messages were disseminated. In addition, these different messages were sufficiently targeted and detailed enough to help almost everyone accurately perceive their local risk, and then act accordingly. The warning system had been refined by experience and it also incorporated findings from public response to warnings research. Consequently, few people lost their lives in a disaster that could have killed many if it occurred 25 years ago.