

RISK COMMUNICATION AND ETHNICITY: ANGLO AND HISPANIC  
RESPONSES TO DISASTER WARNINGS IN  
SAN MARCOS, TEXAS

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THESIS

Presented to the Graduate Council of  
Southwest Texas State University  
in Partial Fulfillment of  
the Requirements

For the Degree

Master of Applied Geography

By

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San Marcos, Texas  
December 2000

## ACKNOWLEDGEMENTS

I express my appreciation to Dr. Denise Blanchard-Boehm for her guidance, encouragement, and many hours of hard work over the past couple years and, especially, in preparing and conducting this study. Dr. Fred Shelley and Dr. Pamela Showalter also deserve recognition for their comments, moral support and patience during this project. A special thanks goes to Mr. Richard Garza and the Hispanic Chamber of Commerce for providing insight to research procedures and for collaborating in obtaining needed information. The Department of Geography also deserves a special thanks for supplying materials for the study. I greatly appreciate the graduate research assistants and Gamma Theta Upsilon members that diligently worked with me on this study. The following students gave their time in collecting data: Shari Forbes, Collin McCormick, Matt Reeb, Kristi Weston, and Dina Zamarripa.

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# **CHAPTER I**

## **INTRODUCTION**

The field of risk communication aims to bridge the gap between those responsible for emergency management and planning, such as city officials and emergency personnel, and the citizenry who are vulnerable to disasters. Federal, state, county and city emergency management experts aim to warn and/or inform the largest number of people, over the widest geographical area, to increased risk so that prudent individual and household decisions might be undertaken. Invariably, however, some people, for various personal, cultural and linguistic reasons, are not able to understand and heed short-term, urgent warnings of immediate threat nor long-term, low-key educational messages related to preparing and mitigating against future disasters.

After decades of studying principles and applications of risk communication for reaching a wide public audience, hazard researchers now recognize that broad theoretical generalizations do not adequately address the needs of “vulnerable populations,” such as the elderly, children, disabled or minorities. Likewise, our generally accepted means of data collection often fail to include pertinent and useful information in situations when applied research is necessary for studying these special groups. This study focuses on the “vulnerable population” of minorities.

The purpose of this study is to shed perspective on whether there is a measurable difference between ethnic groups in hearing, understanding, and responding to warning messages disseminated by hazards experts. If significant differences do exist, then the disseminators of warning messages might consider ways to target and tailor this vital information so that the receivers effectively internalize and engage in actions to save their lives and properties. This empirical research tests the theoretical framework of the generally accepted interdisciplinary model of risk communication developed by hazards researchers from the disciplines of geography, sociology, and mass communication. The contribution to theory by this study includes a better understanding of the importance and role that ethnicity plays in the process of communicating risk.

### **Study Questions**

This study assesses the influence of ethnicity within the “General Risk Communication Model” through a survey of two ethnic groups --Anglo and Hispanic-- in San Marcos, Texas. To achieve the above stated research purpose, five elements of the “General Risk Communication Model” will be explored with regard to ethnicity. These components are: 1) the extent to which groups differ in “hearing” warning messages; 2) characteristics of warning messages created by disseminators; 3) demographic and personal characteristics of receivers of warning messages; 4) an individual’s perception of vulnerability to future risk; and, 5) how individuals in each group respond to these messages. Thus, following the precepts of the risk communication model as a guide, this research contributes to a better understanding of how individuals in two different ethnic

groups *hear, understand, believe, confirm, and respond* to warning messages. The research attempts to answer the following questions:

- 1) Are there any differences between individuals in each ethnic group in their “hearing” or learning of increased risk?
- 2) To what extent do individuals in each ethnic group understand and internalize warning messages disseminated by hazards officials?
- 3) Is there a difference between Anglos and Hispanics in perception of personal vulnerability to risk?
- 4) How do members from each group “respond” upon hearing a “watch” or “warning” related to a severe weather alert?
- 5) What, if any, actions have members of both Anglo and Hispanic identities taken to prepare or mitigate against future disasters?

These questions, which evolve from the “General Risk Communication Model,” guide the study and development of research materials.

### **Definitions**

This section discusses the meaning of key words as they apply to this study. The terms include *risk, hazard, disaster, risk communication, ethnicity, and Hispanic*.

### **Terms of Risk Communication**

Definitions for *risk* differ amongst experts and the general public. Experts, or researchers, express *risk* in a numerical sense as event probabilities, whereas laypersons use linguistic variables or word expressions of uncertainty to describe *risk* (Handmer and

Penning-RowSELL 1990). This paper uses the definition of *risk* used by Burns and Hazen, as presented by Handmer and Penning-RowSELL, thus, a *risk* is “the likelihood of an undesired event multiplied by the consequences of its occurrence” (1990, 234). In other words, a *risk* is identified by the likeliness of an event and the severity of damage from the event. The term *risk* can easily be confused with *hazard*. A *risk* is the actual threat, and a *hazard* is the potential of threat (Handmer and Penning-RowSELL 1990). For example, a river poses a potential threat for flooding. This does not mean, however, that flooding is inevitable. The river and its flooding are the *hazard*. Only some areas will receive flooding from this river. These areas have the actual threat, or *risk*, of flooding (Handmer and Penning-RowSELL 1990). Both of these terms are also related to *disaster*. Drabek defines a *disaster* as a situation in which community resources are incapable of protecting lives and property from a dangerous event (1996). Help is needed from elsewhere. In summary, a *hazard* is the entity that may become a *risk*, and a *disaster* is a *risk* that has become too large for the community to handle.

The term *risk communication*, like *risk*, has multiple definitions. After reading many of these definitions, it has become clear that there is no one true definition for *risk communication*, but rather several. The definition depends on the purpose of the communication and on the user’s concept of *risk*. Because of the different meanings applied to *risk* and the various viewpoints of types of uncertainty, event probabilities, and linguistic definitions that are attached to these meanings, the definition of *risk*, “...affects the purpose of the nature of risk communication. Is this communication merely to inform, or is it to persuade people to accept the risk or to take protective actions?” (Handmer and Penning-RowSELL 1990, 6).

This study uses a goal-oriented approach to *risk communication* by Sandman and colleagues, as expressed by Handmer and Penning-Roswell (1990). *Risk communication* should motivate people out of a stage of apathy and into action without causing panic or anger (1990). This definition shares one of the three purposes that Handmer and Penning-Roswell assign to risk communication. *Risk communication* may: 1) raise hazard awareness; 2) warn individuals of an immediate danger and elicit protective actions; and, 3) persuade people to except the risk or to admit that their concerns were exaggerated (1990). Sandman's definition coincides with the second purpose mentioned.

### **Terms of Demography**

The term *ethnicity* has an interesting origin different from what it means today. It originates from the Greek word *ethnos*, which is an early Greek translation of the Hebrew word *goy*. The King James Version of the *Bible* translates both of these words as "Gentiles" (The New Analytical Bible and Dictionary of the Bible 1973; Strong 1990). *Ethnos* here applies to morally disobedient and uncontrollable people (Fishman 1999). Fishman traces the word *ethnicity* back to the 1470s. The *Oxford English Dictionary* of 1777 defines *ethnicity* as people that are heathen, pagan, uncouth, and neither Christian nor Jew (Fishman 1999). Today, the term generally does not carry these negative connotations but is still used to describe a distinct group of people. In a study of 65 different *ethnicity* definitions found in sociological and anthropological research, Wsevold W. Isajiw identifies the key components used to define *ethnicity* by researchers. He constructs a definition from his study that will be used in this research. Thus, North American *ethnicity* refers to, "an involuntary group of people who share the same culture

or to descendants of such people who identify themselves and/or are identified by others as belonging to the same involuntary group” (Estaville et al. 1999, 11).

The two ethnic groups selected for this study are *Anglos* and *Hispanics*. An *Anglo* is an individual of European descent. Generally, *Anglos* will be of the white race. This study utilizes the definition of *Hispanic* as defined by the United States Census Bureau. A *Hispanic* is, “...a person of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish culture or origin, regardless of race” (Marin and Marin 1991, 21). A mix of races comprises the *Hispanic* ethnic groups, including white, black, and Indian. This study distinguishes between the terms *ethnicity* and *minority*. The literature chapter of this study applies the term *minorities* to those ethnic groups that do not compose the majority of a population, as opposed to the Anglo ethnicity that comprises of the majority of the populations discussed in the literature. *Ethnicities*, or ethnic groups, include all peoples whereas *minorities* only include those ethnic groups that have disproportionately low representation within a population. Thus, the Anglo ethnic group does not belong in the minorities group for the research discussed in this paper.

### **Scope of the Study**

The demographics and location of San Marcos, Texas provide unique opportunities for this study. The “1990 United States Census” (hereafter referred to as the Census) showed the composition of San Marcos population to be about 57 percent Anglo, 37 percent Hispanic, 5 percent African American, and 1 percent other (U.S. Census Bureau 1990). However, the Census estimates that for the year 2000, the Hispanic population in San Marcos will comprise 45.5 percent of the population; the

Anglo, 48.6 percent; 4.6 percent Black (non-Hispanic); and, one percent Asian (non-Hispanic) (San Marcos Chamber of Commerce 2000).

San Marcos has experienced flooding and severe weather since it was first established as a Spanish settlement in 1807. This study area was chosen because of its ethnic diversity and its exposure to these hazards. Chapter III, “Context and Background,” discusses the study area in more detail.

Based upon past risk communication research, this study demonstrates that ethnic groups perceive risks, interpret messages, and respond to warnings in a variety of ways. Conclusions from this study contribute to risk communication theory and to the literature regarding the process of risk communication, especially as it relates to different ethnic groups. Further, the study provides information useful for practical applications for emergency planners in San Marcos, Texas and similar communities.

The following chapter provides a review of the theoretical and applied literature of risk communication.

## CHAPTER II

### LITERATURE

This chapter reviews literature related to theoretical modeling in risk communication. The review begins by exploring the function of risk communication within the “disaster life cycle” and within the warning process. An examination of the “General Risk Communication Model” and its components follows. The last portion of this chapter discusses the role of ethnicity in relation to three main components of the risk communication model.

#### Disaster Life Cycle and Warning Process

In order to explore factors of risk communication, it is important to understand its role and function in relation to the nature of disasters. Drabek suggests that disasters occur in a cycle (1996). The “disaster life cycle” consists of four stages, which may overlap each other at various times. These phases are *preparedness*, *response*, *recovery*, and *mitigation*. The *preparedness* stage occurs before a disaster. It entails the planning for a disaster. The *response* stage of a disaster includes the actions taken during a disaster, such as those to save lives and prevent more damage. The period immediately following a disaster when society tries to return to normalcy is the *recovery* stage. This



stage may last for several years after the disaster event. The next stage, *mitigation*, often times overlaps with recovery and preparedness. The goal of this stage is to prevent a disaster from occurring, reduce the damage from a disaster, and/or decrease the chances of the disaster happening (Drabek 1996). Table 1 provides examples of actions found in each of these phases.

Table 1. Disaster Life Cycle

Stage of Disaster	Strategies
Preparedness	Warning and Alert Systems, Emergency Operations Center, Development of Emergency Operating Procedures
Response	Evacuation, Search and Rescue, Emergency Medical Assistance, Shelters, Alerting the Public, Emergency Instructions to the Public
Recovery	Crisis Counseling, Damage Assessment, Public Information, Reconstruction, Temporary Housing, Debris Clearance
Mitigation	Risk Mapping, Research, Building Codes, Monitoring/Inspecting, Public Education, Land Use Management

Source: Adapted from Thomas Drabek, *The Social Dimensions of Disaster: A FEMA Higher Education Course* (Emmitsburg, MD: Federal Emergency Management Agency, 1996), 5-5.

As Table 1 illustrates, all four phases incorporate risk communication in some aspect. In the *preparedness* stage, efforts focus on the development and public instruction of effective alert systems and warning messages. The *response* stage involves the dissemination of emergency instructions for the public to tell them where to go, when to go there, and how to get to that destination in a safe manner. Information distributed

during the *recovery* stage assists victims in recuperating from a disaster. Communication in the *mitigation* stage concentrates on educating the public in preparing for a future disaster. Generally, the aim of communication efforts in the *preparedness* and *response* stage is towards immediate, short-term warning systems. The *recovery* and *mitigation* phases usually involve long-term public education efforts. This study focuses mainly on risk communication efforts found in the *preparedness* and *response* stages of the “disaster life cycle.”

Handmer and Penning-Rowell (1990) identify five requirements for successful risk communication efforts. These requirements specify that the communication process must: 1) identify the risk; 2) must be sent out to people who; 3) need to know about the risk; and, after 4) believing the message; 5) will take action (Handmer and Penning-Rowell).

This study will use the “General Risk Communication Model” (GRCM), developed by Blanchard (1992) from Sorenson and Mileti’s, “Warning Process Model,” (1988) as a tool to better understand and visualize the relationships between key components involved in disseminating emergency information to the public (see Figure 1). These components include message characteristics, receiver characteristics, receiver perceptions, and response (Blanchard 1992). These components reflect behaviors of *hearing*, *confirming*, *understanding*, *believing*, *personalizing*, *confirming* and *responding* (Mileti et al. 1990). The next section of the literature review identifies important variables of the key components and the placement and role of these variables within the “General Risk Communication Model.”

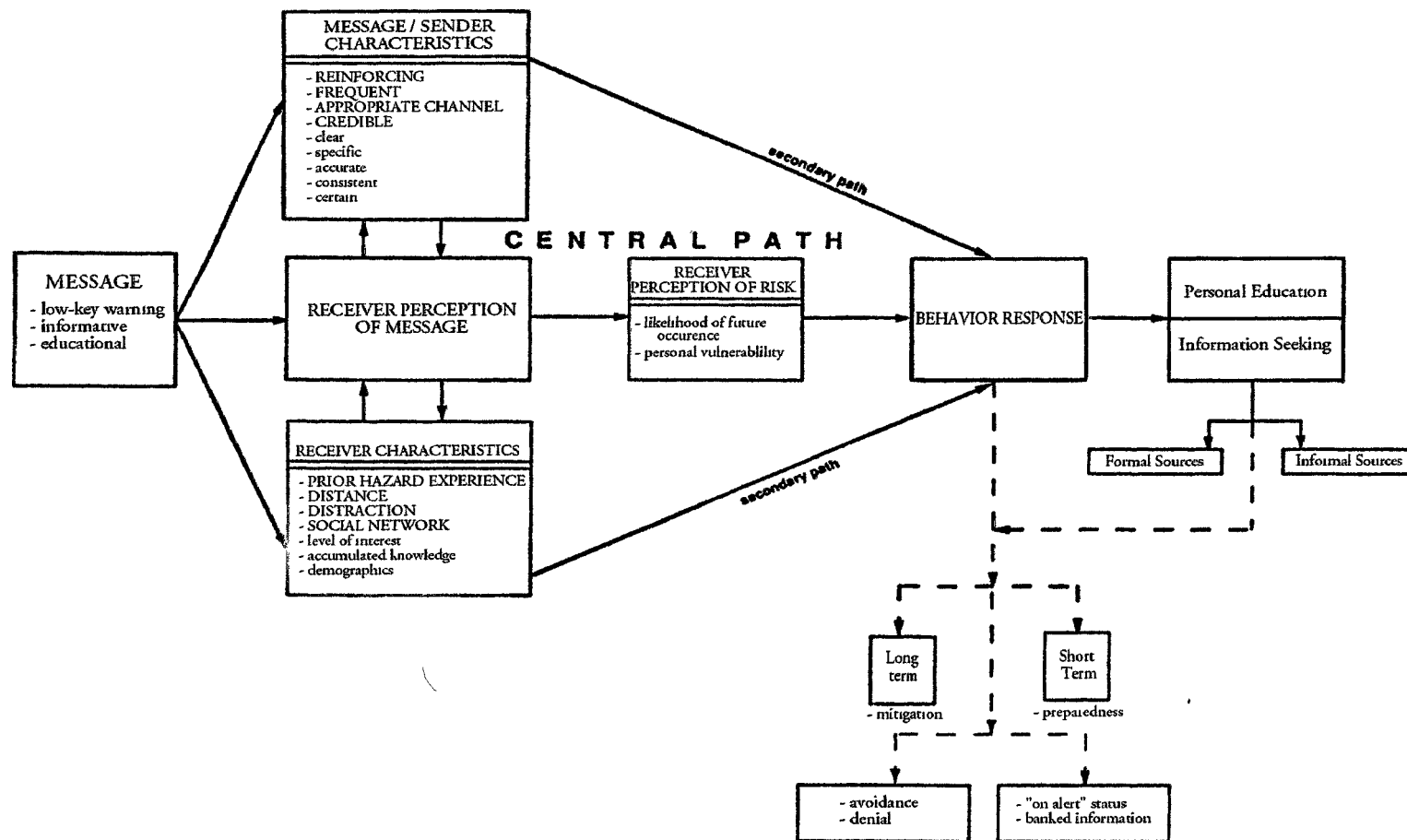


Figure 1. The General Risk Communication Model. From R. Denise Blanchard, "Risk Communication and Individual Response: Impact of the 1990 revised earthquake probabilities for the San Francisco Bay Area" (Boulder: University of Colorado, 1992), 30.

### **Variables of the General Risk Communication Model**

Four main components comprise the variables that researchers consider effective in determining response behavior towards warning messages. These components are:

1) message characteristics; 2) receivers' characteristics; 3) receivers' perceptions of risk; and 4) response behavior of receivers after hearing warning messages (Blanchard 1992).

#### **Message Characteristics**

Mileti categorizes message characteristics into four groups: 1) message content and style; 2) attributes of frequency; 3) channel type and aspects; and, 4) traits of message sources (1990). Handmer and Penning-Rowsell (1990) and Drabek (1996) enforce the importance of message content, channel traits, and frequency of messages by listing them as variables of communication success.

The *content* of a message intends to inform an individual of the type of risk, the location of the risk and how to react to this risk (Mileti 1990). Factors related to message *content* and *style* include clarity, simplicity, certainty, specificity, relevancy, consistency, tone and personalization. Messages to be interpreted by the public must be presented in an understandable form. The non-scientific public has difficulty with messages that carry in-depth scientific terms, complex statements, and vague instructions (Drabek 1996; Handmer and Penning-Rowsell 1990; Mileti et al. 1990). Thus, messages should be kept simple, clear, specific and non-technical in order to prevent any confusion (Drabek 1996; Mileti et al. 1990; Nathe et al. 1999). Perry and colleagues report that, in some cases, the more specific the warning, the higher the individual acceptance of the

message, and the greater the belief in perception of risk (1982). The message needs to be certain of the location and extent of the risk and also be consistent over time and in relation to other warnings (Mileti et al. 1990). Handmer and Penning-Rowse explain that a message should relate to the audiences' "normal environment" and should pertain to their needs (1990). Messages with tones that are not demanding or demeaning prove to be more successful than messages that appear as sermons or dictatorial edicts (Connelly and Knuth 1998; Nathe et al. 1999). Messages that are personalized, or directed towards a particular target audience, and that are personally delivered seem to be the most effective for ensuring successful risk communication (Blanchard 1992; Handmer and Penning-Rowse 1990).

Attributes of *frequency* discussed in the *Parkfield Earthquake Experiment Report* by Mileti and colleagues (1990) include the number of times a message is disseminated, the time interval between messages, and the number of different messages sent out. In a study of 24 disaster events by Mileti and Sorenson, as reported by Drabek (1996), the time required for 90 to 100 percent of the population to receive the warning was about three to four hours. Furthermore, only a portion of the message recipients took action.

Many studies have indicated that warning repetition increases attitude changes toward an immediate danger (Blanchard 1992; Drabek 1996; Perry and Nelson 1991). However, research also shows that most attitude changes occur with only a few repetitions (Blanchard 1992). Beyond this number of warning messages, the public appears to suffer an over-load of warning information and becomes bored with the saturation of messages (Blanchard-Boehm 1999; Handmer and Penning-Rowse 1990).

The message characteristics of *channel* and *source* are often times confused or mixed together. It is important to distinguish between these two message characteristics since they each have a unique and significant impact on how individuals will respond to an immediate threat of disaster. A *channel* refers to the medium used to transmit a message, whereas an information source is the sender, which could be an agency or person(s) (Perry and Nelson 1991). Examples include radio, television, and newspaper. Sometime a channel can act as a *source* as well as a *medium* of information dissemination, thus contributing to the confusion of the two terms. Risk communication messages can be sent from various *sources*, such as emergency authorities, political personnel, friends, family, public speakers, television stations, and radio stations.

Mileti (1990) categorizes channels as either informal or formal. Friends, family, neighbors, and other social networks comprise the informal channels. Formal channels include newspaper, radio and television. For risk communication success, researchers suggest using multiple channels that are well-used and respected by the public (Blanchard 1992; Handmer and Penning-Rowse 1990; Mileti et al. 1990; Nathe et al. 1999; Perry and Nelson 1991).

The last message characteristic discussed refers to the message *source*, or sender. Sender credibility and attractiveness summarize the main source factors influencing the effectiveness of risk communication (Blanchard 1992; Drabek 1996; Handmer and Penning-Rowse 1990; Mileti et al. 1990; Nathe et al. 1999; Perry and Green 1982). Sender credibility pertains to a source's expertise, trustworthiness, objectivity, sociability, and dynamism (Blanchard 1992). As reported by Drabek (1996), Mileti and Sorenson, in the previously mentioned study of 24 disaster events, conclude that individuals contact and

consult a mixture of sources in receiving message warnings and in confirming warnings. Blanchard-Boehm (1998) also draws similar conclusions from a study of the San Francisco Bay Area. Various studies indicate that this mixture of sources consists of both scientific and non-scientific or pseudoscientific sources (Farley et al. 1991; Showalter 1993; Turner, Nigg, and Paz 1986). Showalter's study (1993) of the New Madrid Seismic Zone, in confirming previous research, illustrates that individuals seek information from both the scientific and non-scientific communities even when the messages of the two sources conflict (Farley et al. 1991; Turner, Nigg, and Paz 1986).

In reference to the 1996 Drabek study, Perry and Lindell find that people consult mainly the mass media and peers for confirmation of messages. These findings have relevance for emergency planners when considering the "Greenspoon Effect" as presented by Perry and Nelson (1991). The "Greenspoon Effect" occurs within social networks and refers to a message as it changes while passing from person to person (Perry and Nelson 1991). Thus, researchers recommend messages to come from an official source (Blanchard 1992; Blanchard-Boehm 1998; Drabek 1996).

Sender attractiveness consists of two aspects: 1) the appeal of the source to the public; and, 2) the similarities between the source and the receivers (Blanchard 1992; Mileti et al. 1990). Handmer and Penning-Rowsell (1990) express the effectiveness of using sources that display a "we are on your side" attitude to the public and that play a positive role within the community. One other factor that appeals to the public is the level of familiarity that individuals have with the source issuing the risk communication message (Mileti et al. 1990).

All the characteristics discussed above are items within the control of persons and agencies involved in emergency management. However, many variables exist that emergency managers cannot determine but that are important components of developing successful risk communication efforts. The next section addresses these variables as receiver characteristics.

### **Receiver Characteristics**

Receiver characteristics of risk communication can belong to one of three categories: the environment, social attributes, and psychological attributes (Mileti et al. 1990). The *physical* and *social environments* provide cues to individuals about the nature and the seriousness of a disaster. Continuous rainfall and rising river levels are examples from the physical environment. Observing neighbors securing their windows with boards due to hurricane warnings would be an example of a social cue.

*Social traits* of receivers involve recipients' social networks, resources, demographics, and activities at the time of warning (Mileti et al. 1990). The level of influence of social networks varies, depending on the presence or absence of children, family structure, cultural norms, relationships with peers, involvement in the community and interactions with neighbors (Blanchard 1992; Drabek 1986; Drabek 1996; Handmer and Penning-Roswell 1990; Fothergill et al. 1999; Mileti et al. 1990; Perry and Green 1982; Perry and Mushkatel 1984). Physical and economic resources available to recipients affect their level and nature of response and preparedness. These resources might include having a car in which to evacuate or enough income to purchase flood insurance. Researchers have found many demographic characteristics influence recipients'



interactions with warning messages. Demographic traits include age, education level, economic status, ethnicity, length of residency, and gender (Blanchard 1992; Drabek 1986; Drabek 1996; Fothergill et al. 1999; Handmer and Penning-Rowsell 1990; Mileti et al. 1990; Perry et al. 1982; Perry and Green 1982). In examining the social factors that constrain response, Drabek (1996) finds that those with a more active response tend to be male, young, and members of non-minority groups. The fourth social attribute, activity at time of warning, pertains to the location and preoccupations of individuals when they receive warning messages (Blanchard 1992; Drabek 1996; Mileti et al. 1990). Drabek (1996) indicates that those who receive messages while at work are more likely to take action.

The last set of receiver characteristics address the *psychological conditions* of individuals. Drabek (1996) delineates several traits that would be considered psychological attributes. These characteristics include previous disaster experience and preparedness level. His findings agree with, and support, previous studies that include these two variables of risk communications (Blanchard 1992; Mileti et al. 1990). Other psychological attributes affecting response include prior knowledge, level and locus of control, awareness of distance from risk, preparatory actions and self-esteem (Blanchard 1992; Mileti et al. 1990).

The social and physical environment, social context, and psychological traits of individuals comprise the group of receiver characteristics that risk communicators utilize in developing effective warning systems. The next section of this literature review discusses the third main component of the GRCM, receivers' perceptions of risk.

## **Receivers' Perceptions of Risk**

When measuring perceptions of risk, the GRCM analyzes two main variables: receivers' views of the likelihood of future occurrences and of levels of personal vulnerability to risk. In a study of the San Francisco Bay Area, Blanchard (1992) finds that individuals' beliefs of likeliness of a future earthquake, opinions of scientific predictions, perceptions of personal vulnerability, and perceptions of preparedness are directly related to how the individuals *hear, understand, believe, personalize, confirm* and *respond* to warning messages. Many factors shape and influence individuals' perceptions of risk. Some of these factors are the ones previously mentioned as message characteristics and receiver characteristics. Handmer and Penning-Rowsell (1990) would also include that the entire socio-political and cultural context affects risk perceptions, as well. Drabek (1996) lists constraints on risk perception as: gender, age, previous exposure, location, job dependence and personality.

All of the variables explored in the sections of message characteristics, receiver characteristics, and receiver perceptions of risk contribute to the theoretical framework of the GRCM and its application to emergency planning. The rest of this chapter focuses on the role of ethnicity (found in "Receiver Characteristics") and its interactions with variables in other components of the GRCM and warning systems processes.

## **Role of Ethnicity in the General Risk Communication Model**

The following sections analyze the influence of ethnicity upon three aspects of the GRCM -- risk perceptions, interactions of message and receiver characteristics, and responses of receivers.

## **Influence of Ethnicity on Risk Perception**

In 1986, Thomas Drabek suggested that some differences in risk perception according to ethnicity existed but the literature base was too limited, and only inferences of the relationship were apparent. In the prior decades of hazards research, concerns of ethnicity, gender and special populations were always subsumed under a larger theme of study. Investigation of these sub-populations, however, has begun to develop over the past decade. Recent publications, however, have produced mixed conclusions. Fothergill and colleagues (1999) find conflicting results from several hazard events. Aptekar's study, as reported in Fothergill (1999), reported that Mexican-Americans had higher level of risk perception than Anglos during the 1989 Loma Prieta earthquake in the San Francisco Bay area; however, this difference was attributed to past experience with the 1985 Mexico City earthquake. The review by Fothergill and colleagues (1999) also indicates that African-Americans appear more fatalistic than Anglos and Mexican-Americans and that Anglo males seem the least concerned about natural hazard risks (Palm 1996). Blanchard-Boehm's (1999) study of earthquake risk perception, as reported by Fothergill and colleagues (1999), demonstrates that African-Americans tend to perceive a high risk of future damage to their homes.

Other studies also present myriad results. For example, a study of flooding in Charlotte, North Carolina, conducted by Ives and Furseth (1983), yields no difference in risk perception between various ethnic groups. In this study, African-Americans were more likely to see flooding as uncontrollable than as Anglos viewed it. Sokolowska and Tuszka's (1995) study of perception in lesser-developed nations indicates that minorities have a "real" perception of danger and are just as concerned about environmental risks as

Anglos. Perry and Green (1982) also find that minorities define danger differently than Anglos.

Several studies suggest that, overall, minorities have lower risk perceptions than Anglos (Perry and Green 1982; Perry and Mushkatel 1984). Various studies by Perry and fellow researchers (1982, 1984) indicate that Mexican-Americans perceive dangers at lower levels than Anglos, even when warnings have been heard. From his literature review, Drabek (1986) concludes that both minorities and Anglos have higher levels of perceptions of personal vulnerability when warned by a credible source. This agglomeration of findings further supports the proposition that each sub-population has unique characteristics and that ethnic groups perceive their vulnerability to risks in a variety of ways.

### **Influence of Ethnicity on Message-Receiver Interactions**

As mentioned in the first section of this chapter, many variables of the communication message affect individuals' behaviors during a disaster. The risk communication literature addresses some ethnic differences in receiving and interpreting warning messages. In several studies, Perry and colleagues (1982, 1984) discover that minorities have less faith in warnings than Anglos do. This finding may be a result of other influential variables. Important variables to consider include: level of community involvement; socioeconomic condition; and, perception of message source (Drabek 1986; Perry and Green 1982; Perry and Mushkatel 1984). Minorities tend to receive risk information from social networks and relatives (Drabek 1986; Perry and Lindell 1991). From a literature review by Fothergill and colleagues (1999), the following generalizations

can be made: 1) Anglos receive information from formal, English speaking sources; 2) Latin-Americans obtain risk information from informal sources such as friends and family; and, 3) African-Americans and Hispanics are more likely to use social networks for risk communication. However, a study of Hurricane Andrew by Morrow (1997) indicates that urban families, despite ethnicity, were dependent upon family relations during the disaster.

Perry and Lindell (1991) find that ethnic groups have different perceptions as to what constitutes “credible sources.” With short-term warnings, minorities and Anglos view authorities as the credible source. During long-term communications, minorities, especially Mexican-Americans, rely upon social networks. Anglos seem more prone to “hear” warning messages from the mass media. From this study, Mexican-Americans were also found to “confirm” messages more than Anglos do and to contact a higher number of confirmation sources than Anglos. Perry and Lindell also note that ethnicity in this study appears to interact with forewarning and event familiarity.

Ensuring belief in a message is important to guiding appropriate response. Studies suggest that a higher belief in messages is related to response level of individuals (Perry et al. 1982; Perry and Mushkatel 1984). The remainder of this literature review explores the various responses of ethnic groups.

### **Influence of Ethnicity on Risk Response**

In reviewing literature of ethnicity and response, it is important to keep in mind the variables that appear to interact with ethnicity. For instance, studies indicate that minorities tend to have stronger family ties, have a lower economic status and are less

involved in the community than Anglos (Drabek 1986; Perry and Mushkatel 1984). These variables might aid in explaining disaster response differentials of various ethnic groups.

The majority of literature that discusses ethnicity and disaster behavior addresses the *response* stage of an event. The sub-field of mitigation and preparation as it impacts ethnicity is limited in research, but some differences are still evident. Studies indicate that Anglos make more structural changes, are more likely to develop a plan, have more opportunities for hazard education and obtain more adequate insurance than minorities (Fothergill et al. 1999; Peacock and Girard 1997). Studies in the aftermath of the Hurricane Andrew expose insurance “red-lining” practices, that is providing purchasing opportunities of insurance with well-known companies to only certain ethnic groups. Thus minorities of the area, African-Americans and Mexican-Americans, were less likely to be insured by one of the top three companies in the nation. In addition, this study also finds that African-Americans were the least likely to store food and supplies, while Asians were the least likely to have a plan (Peacock and Girard 1997). Hazards researchers conclude that because minorities have more limited financial resources than Anglos do, they are unable to make structural changes and invest in adequate insurance.

The most extensive portion of the literature in ethnicity and risk communication addresses evacuation practices during the *response* stage of a disaster. The results from studies conflict in regarding minority evacuation compliance. For instance, a study by Perry and Lindell (1991) suggests that ethnicity does not affect evacuation compliance but does influence individual motivation and emergency decision-making processes. Their study concluded that evacuation compliance interacts with risk perception, planning, and family context. However, several studies have indicated that minorities are less likely to

evacuate than Anglos (Fothergill et al. 1999; Perry and Green 1982; Drabek 1986; Perry and Mushkatel 1984). Ethnicity appears to interact with several variables of the “Evacuation Model” developed by Perry and Mushkatel (1984) -- personal risk perception, kin relationships and community involvement. Further, these researchers demonstrate that during a disaster, Mexican-Americans tend to take protective actions instead of evacuating (Perry, Lindell and Green 1982; Perry and Mushkatel 1984).

After 1992 Hurricane Andrew, some ethnic differences arose in damage and insurance settlements. Minorities, especially African-Americans, reported a statistically significant higher rate of damage (Morrow and Peacock 1997). These differences might have also been influenced by low income, poor housing quality, limited credit resources and high segregation of the area. In paying for damages, minorities were less likely to use federal programs and had significantly lower amounts of sufficient insurance settlements (Peacock and Girard 1997).

Studies produced after Hurricane Andrew conclude that minorities encounter more problems during the *recovery* stage of a disaster than Anglos do (Dash, Peacock and Morrow 1997). African-Americans were less likely to relocate than Anglos and Hispanics because of segregated neighborhoods and economic limitations (Peacock and Girard 1997). Recovery time for African-Americans was also longer than Anglo recovery time (Peacock and Girard 1997).

The three main relationships seen in the model and the effects of ethnicity upon these relationships build upon the theoretical framework in this study.

### **Importance of the San Marcos Case Study**

The disaster responses in San Marcos, Texas will add to the limited literature base in “risk perception and ethnicity” and in “mitigation/preparation and ethnicity.” The findings will also confirm and enhance studies of “ethnicity and message interpretation” and of “ethnicity and disaster behavior.” These contributions, in conjunction with evolving risk communication research related to vulnerable populations, will provide guidance for the role that ethnicity plays regarding the process of communicating, risk to these groups.

In addition, this study will also provide practical information that emergency planners might utilize in San Marcos, Texas, and similar communities. Planners will understand how ethnic populations “hear” messages and then “respond.” Policies and risk communication efforts may then be developed to suit the motivations and communication behaviors of ethnic groups in San Marcos. Recommendations and policy suggestions may be applied, as well, to other levels of government planning, such as at the state and national levels.

Chapter III discusses the importance of theoretical modeling in research and practice and provides background information of hazards and ethnicity in the United States, Texas, and San Marcos.



## **CHAPTER III**

### **BACKGROUND AND CONTEXT**

This chapter explores the background and context of this study through: 1) an overview of theoretical modeling and its applications; 2) a discussion of several risk communication efforts; 3) an analysis of hazards and ethnicity at the national, state, and local levels; and, 4) a summary of emergency management in San Marcos. Information in these sections emphasize the importance of this study specifically and of risk communications research in general.

#### **Theoretical Modeling in Risk Communication**

Drabek (1996, 13-2) defines *theoretical modeling* as, "...a network of interrelated propositions that collectively explain or account for a specific pattern or range of human behaviors." Theoretical modeling serves multiple purposes to both researchers and practitioners. For researchers, modeling provides the following:

- 1) It can display many variables of human behavior at one time;
- 2) Generalize patterns seen in various disasters;
- 3) Provide scientific reproducibility thus controlling research bias;
- 4) Explain behaviors in specific instances;

- 5) Integrate past and future research studies;
- 6) Serve as “road maps” for emergency managers; and,
- 7) Guide public policy makers (Drabek 1996).

In his course book for disaster researchers and planners, Drabek points to areas with ample room for further research. The areas related to this study are in the development of new strategies to assist ethnic minorities and homeless persons and in the education and sheltering of special populations. In addition, findings from this study will aid in creating long-term education programs by identifying target audiences, establishing a community profile, and determining ways the target audiences might better receive warning information.

In the realm of emergency management, results from theoretical modeling provide the following areas:

- 1) Debunking of common sense explanations that are erroneous;
- 2) Comprehension of future research studies;
- 3) Training of personnel in various agencies;
- 4) Participation in broader professional networks;
- 5) Avoiding misuse of research studies;
- 6) Organization and integration of future readings;
- 7) Designing of future research studies;
- 8) Development of disaster plans and programs; and,
- 9) Guidance in policy implementation and presentation (Drabek 1996)

These roles of theoretical modeling help merge the different worlds of researchers and practitioners. The researchers produce the knowledge relied upon by emergency planners

as they try to solve problems in the real world. The following examples serve two purposes: 1) they provide insights to what types of problems planners face in the real world; and, 2) they illustrate how theoretical frameworks can contribute to and even prevent the chaos experienced by risk communicators.

### **Examples of Risk Communication**

In order for warnings to yield the desired results, planners need to know the geo-demographic composition of a population, that is, how individuals “hear” warning messages, and what motivates them to heed the warnings. By knowing these factors, risk communicators can construct more effective warnings. If a common communication framework between experts and the public cannot be determined, planning and relief efforts will be hampered. The following examples illustrate the importance of a common communication framework.

After the 1989 Loma Prieta earthquake, residents, instead of staying in shelters, relocated to outdoor parks. In response to the situation, authorities brought tents and food to the parks for the victims. Unfortunately, the cultural diversity of the groups was not considered when planning relief efforts. Victims became ill from the food that was inappropriate and foreign to their cultural practices. The tent colonies, somewhat reflective of concentration camps, aroused terror among refugee families who had fled harsh military and governmental treatment (Phillips 1993). Because of these actions, civilians were more reluctant to trust and follow relief efforts of officials.

During the Johnston Island controversy of 1990, the U.S. Army commanders and Polynesian citizens of this Pacific Ocean island failed to reach a common ground of

communication when the U.S. Army planned to transport a European stockpile of chemical weapons to Johnston Island. Risk experts concentrated on the probability of a big disaster while natives were concerned with both small and large events. The natives saw the possibility of these events in terms of images and as being linked to each other. The U.S. Army approached the events in scientific terms and presented the possible events as independent of each other. Each group attached its own meaning to terminology and, thus, misinterpreted messages and drew inappropriate conclusions. The controversy confirmed Kasperson's (1988) claim that in disseminating risk information, words have different meanings for various social groups. The gap between the experts and natives resulted in insult, frustration, mistrust and loss of credibility (Rogers 1992).

These two examples demonstrate the need for a commonly understood communication framework between risk experts and the public when planning for and responding to a disaster. A common framework is essential when confronting various types of environmental hazards, whether natural or technological. As indicated from these two cases and from public education efforts in the San Francisco Bay Area in California, risk communication efforts should be tailored to the needs and characteristics of the desired audience (Blanchard 1992; Nathe et al. 1999). For successful efforts, planners should view the audience as a mixture of backgrounds.

### **Trends in Hazards and Ethnicity**

An examination of current population trends accentuates the importance of risk communication research. Current trends indicate an increased exposure of populations to risks and disasters from hazards and a growth in the ethnic diversity of the population at

the national, state, and local levels. This section analyzes the population trends at each of these levels.

### **Hazards and Ethnicity in the United States**

In 1999, the total population of the United States was estimated to be about 257 million people with a projection of 288 million people for the year 2006 (Mileti 1999). Approximately 28 percent of this population currently lives within 100 miles of a coast where the vast majority of disasters in the U.S. occur (Mileti 1999). The movement of people from inland to the coasts has increased the vulnerability of U.S. residents to hazards. Since 1940, the number of U.S. disasters, causing 25 deaths or more, has tripled (Mileti 1999). In addition to the increase in disaster related deaths, the cost of disasters incurred upon the U.S. government and its citizens has grown exponentially from 1975 to 1995 and is expected to continue at this rate (Mileti 1999). Figure 2 illustrates this growth by showing the average annual costs of disasters from 1975 to 1994.

Climatological events account for 80 percent of these costs, while earthquakes and volcanoes account for another 10 percent (Mileti 1999). Climatological hazards that pose risks include extreme cold, hurricanes, tropical storms, drought, floods, tornadoes, wind, hail, fog, heat, ice, sleet, snow, and lightning. Most losses, in terms of deaths and dollar damages to crops and property, from 1975 to 1994, occurred as a result of flooding (Mileti 1999). Deaths have totaled more than 1,600, with estimates exceeding 2,200. Annual property losses from flooding in this time period range from \$19.6 billion to \$196 billion.

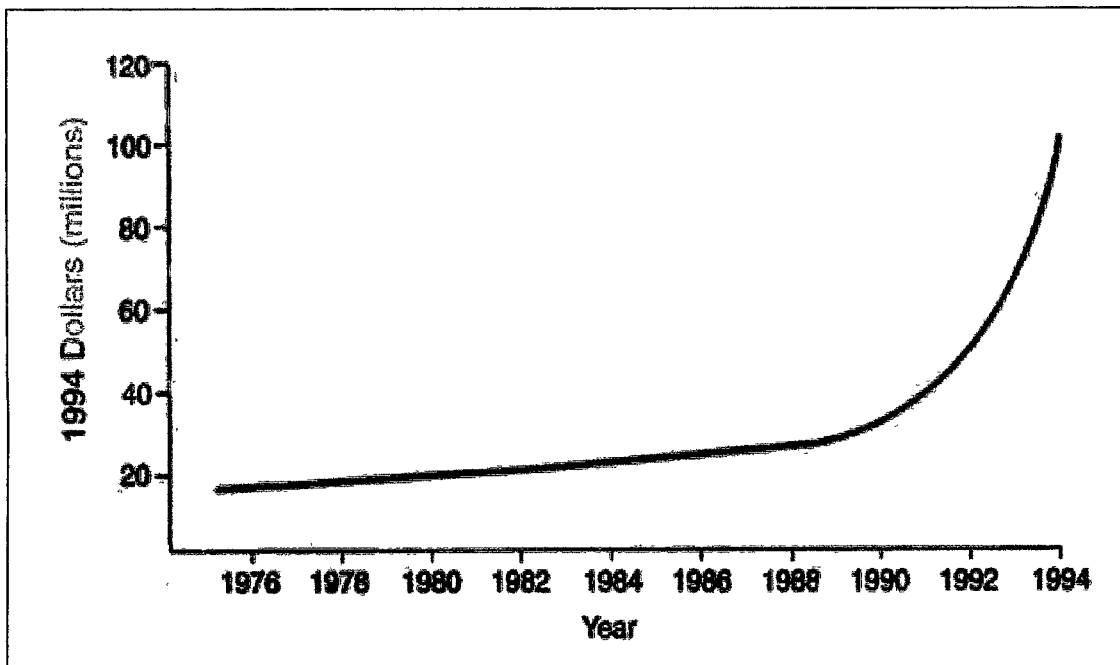


Figure 2. Average annual losses from disasters in the United States from 1975 to 1994. Losses represented in 1994 dollar amounts. From Dennis S. Mileti, *Disasters by Design: A Reassessment of Natural Hazards in the United States* (Washington D.C.: National Academy of Science, 1999), 67.

In developing communication efforts to decrease these numbers of deaths and damage costs, researchers identify the particulars of people being affected by these losses. Marin and Marin (1991) report that the U.S. Census Bureau shows a 50 percent increase in the United States' population from 1950-1980. Further, this increase consists of a 265 percent growth in the U.S. Hispanic population. From 1980 to 1988, the Hispanic population increased another 34.4 percent (Marin and Marin 1991). In 1994, the U.S. Census Bureau estimated the population as 74 percent white/non-Hispanic; 12 percent, black; 10 percent, Hispanic; and, 4 percent other/Asian (Mileti 1999). Projections by the Census Bureau indicate a shift in this demographic composition; in the year 2050, the population is expected to be 53 percent white/non-Hispanic, 22 percent Hispanic, 14

percent black, and 11 percent Asian/other (Mileti 1999). Figure 3 shows the percentage of the total population that Hispanics comprise in each state.

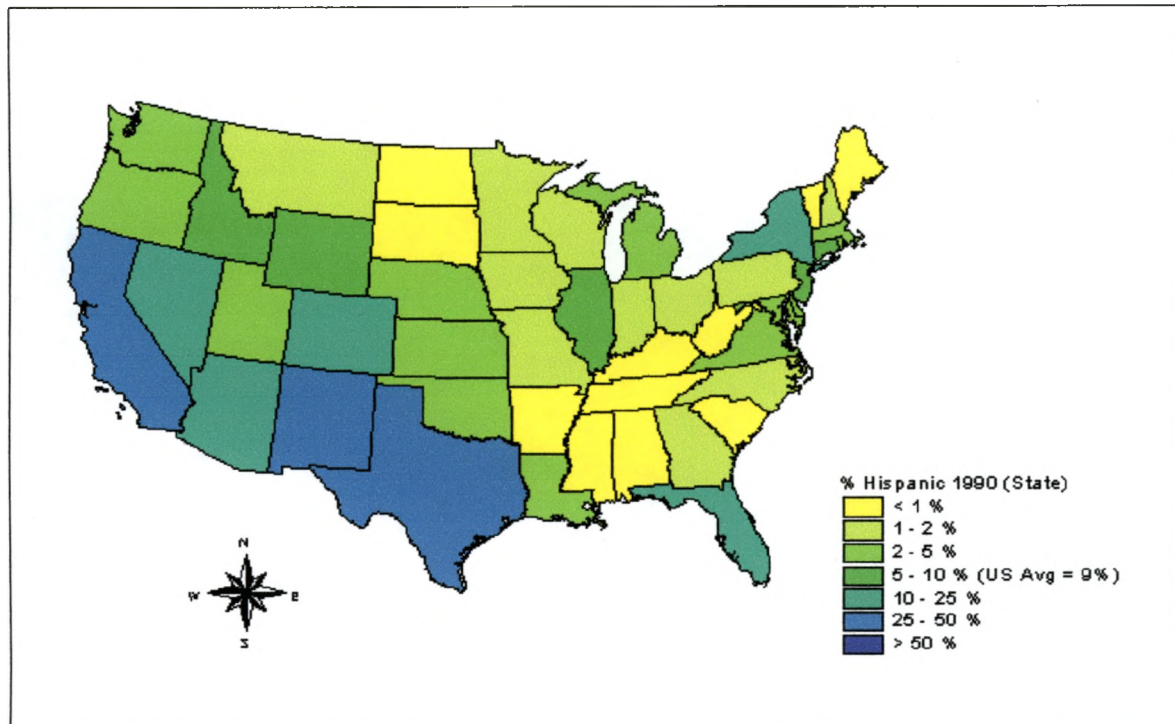


Figure 3. Map of United States' Hispanic population by state. Data from 1990 U.S. Census.

When looking at hazard and ethnicity trends in the United States, Texas appears at the top of the list for high numbers of disaster events as well as growth of the Hispanic population. The next section examines population trends in the state of Texas.

### Hazards and Ethnicity in Texas

Mileti ranked the states by level of “hazardousness,” based upon the frequency of disaster events, deaths, injuries and damages that occurred during the 1975 to 1994 time period. This rough estimate of hazardousness ranked Texas as the most hazardous state,

followed by Florida, Georgia and Ohio (Mileti 1999). Mileti used these raw hazardousness scores, the standardized area of the state, and the standardized population of the state to categorize each state as “high”, “medium” or “low” hazardousness. Texas falls into the “high” hazardousness category. Figure 4 displays these rankings. In a study of repetitive flood losses from 1978 to 1994, the National Flood Insurance Program found the highest number of repetitive claims to be from the Southeast, Midwest, mid-Atlantic states, and California (Mileti 1999). Louisiana and Texas had the most claims in the study (Mileti 1999).

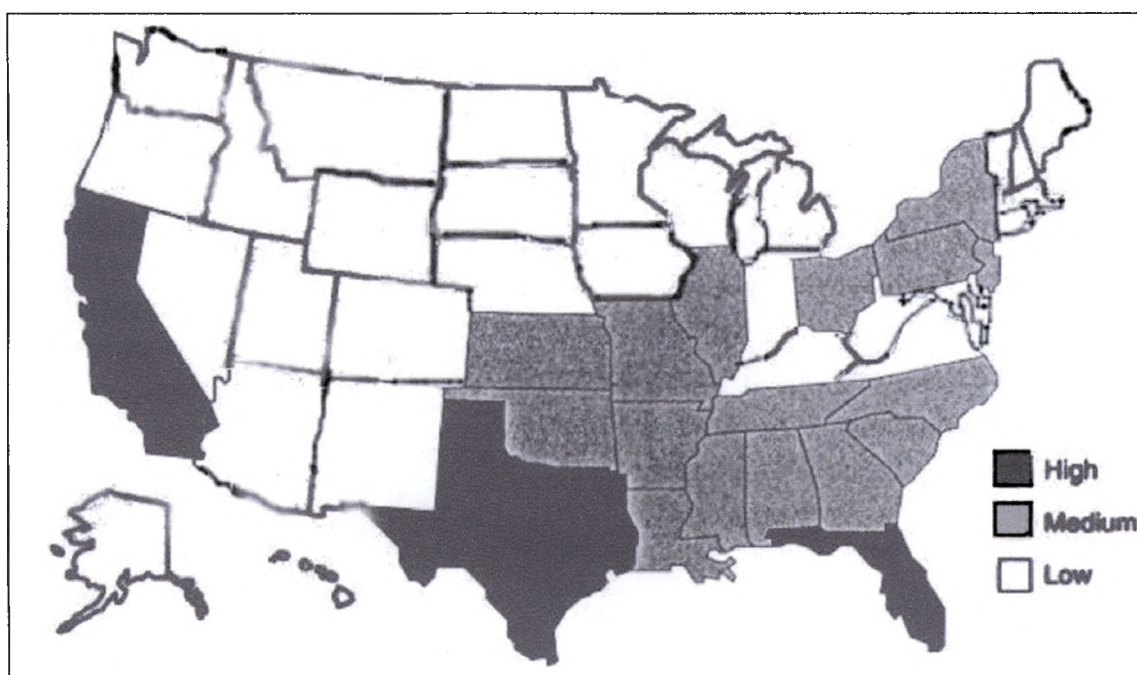


Figure 4. Map of hazardousness by state. From Dennis S. Mileti, *Disasters by Design: A Reassessment of Natural Hazards in the United States* (Washington D.C.: National Academy of Science, 1999), 95.

In terms of ethnicity, Texas also ranks high when comparing Hispanic populations by state and percent growth of the Hispanic population. Texas ranks second, behind



California, in total population for Anglos and Hispanics. In 1990, Hispanics comprised about 25 percent of the Texas total population. From 1990 to 1999, the U.S. Census Bureau reports an estimated 39 percent increase in the Hispanic population and a 16 percent increase in the Anglo population for the State of Texas (U.S. Census Bureau 1999). Figure 5 shows the 1990 population distributions of Hispanics, in percentage of the total population, by county in the State of Texas.

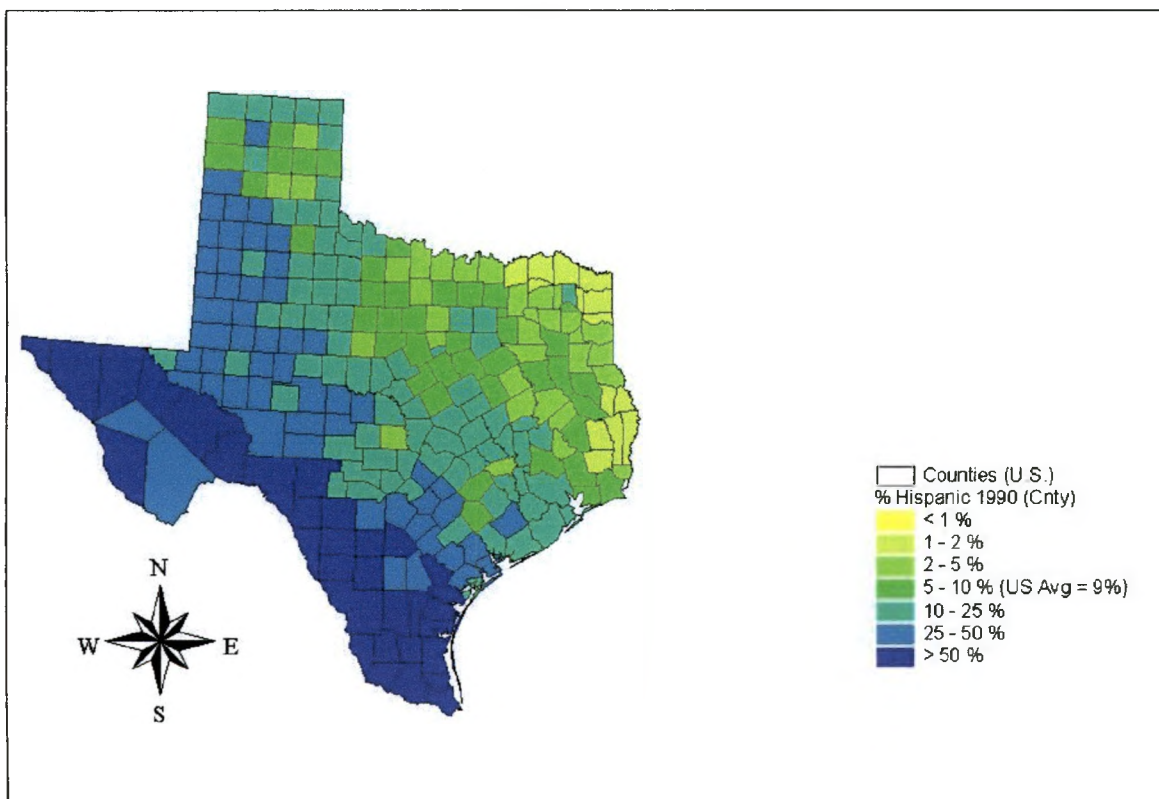


Figure 5. Map of Texas Hispanic population by county. Data from the 1990 U.S. Census.

### Hazards and Ethnicity in the San Marcos Area

San Marcos, Texas, located in Hays County, is approximately 30 miles south of Austin and 45 miles north of San Antonio. This section presents a general overview of the

hazards and ethnicity in the area between Austin and San Antonio, referred to as the Austin-San Antonio Corridor. Specific data about hazards and ethnicity in San Marcos are included in the section of this chapter entitled “Characteristics of the Study Area.”

Because of its latitudinal position and location in relation to the Gulf of Mexico, the Austin-San Antonio Corridor is prone to severe weather from the invasion of cold fronts and the rain bands of hurricanes and tropical storms. Annually, severe weather events cause damage to lives and property from strong winds, hail, flooding, and tornadoes.

Ethnicity of this region is examined by observing demographics of three areas: the San Antonio Metropolitan Statistical Area (MSA), the Austin-San Marcos MSA, and Hays County. San Antonio contains the largest Hispanic population of all three areas. Table 2 gives the 1990 demographic characteristics and population projections for 2000 and 2025 for both of the MSAs. Hays County population is estimated to consist of 59.8 percent white/non-Hispanic, 3.4 percent black/non-Hispanic, 0.8 percent Asian/non-Hispanic, 0.3 percent other/non-Hispanic, and 35.7 percent Hispanic by the end of 2000 (San Marcos Chamber of Commerce 2000).

### **Characteristics of Study Area**

In studying San Marcos, it is important to understand: 1) the levels of risk and location of hazards; 2) the assessment and definition of these risks; 3) where people live in relation to these risks; 4) the characteristics of these populations; and, 5) what programs exist for emergency planning. The following three sections -- the physical geography, the human geography, and emergency planning in San Marcos -- explore these issues.

Table 2. Ethnic distributions of total population in Austin-San Antonio Corridor\*

Population Group	1990 Population		2000 Projection		2025 Projection	
	Austin-San Marcos	San Antonio	Austin-San Marcos	San Antonio	Austin-San Marcos	San Antonio
White	67.5	44.7	62.8	39	50	27.7
Black	9.1	6.5	8.5	6	6.6	4.5
Hispanic	21	47.4	24.8	52.5	34.1	60.7
Other	2.4	1.4	3.9	2.5	9.3	7.1

\* Numbers are reported in percentages.

Source: Data from the United States Census Bureau.

### The Physical Geography of San Marcos

San Marcos is located in central Texas at the intersection of three natural regions: Blackland Prairie, Gulf Coastal Plain, and Texas Hill Country. The headwaters of the San Marcos River form the boundary between these three regions and receive runoff from Hill Country streams. These streams flow through the Gulf Coast Plains and eventually empty into the Gulf of Mexico. Figure 6 illustrates the location of San Marcos in relation to the three natural regions near it and the topography of the Hill Country.

The physical geography of the central Texas region causes it to be especially prone to flash flooding. The Upper San Marcos Watershed, located on the edge of the Texas Hill Country, consists of approximately 95 square miles. The topography of the Hill Country region is similar to canyonlands -- a series of ridges and valleys formed from erosion by numerous streams. These streams have low infiltration rates because of the limestone streambeds. Slopes in this region range from 8 to 30 percent and consist of shallow, stony clay soils (U.S. Department of Agriculture 1984). When moistened, these

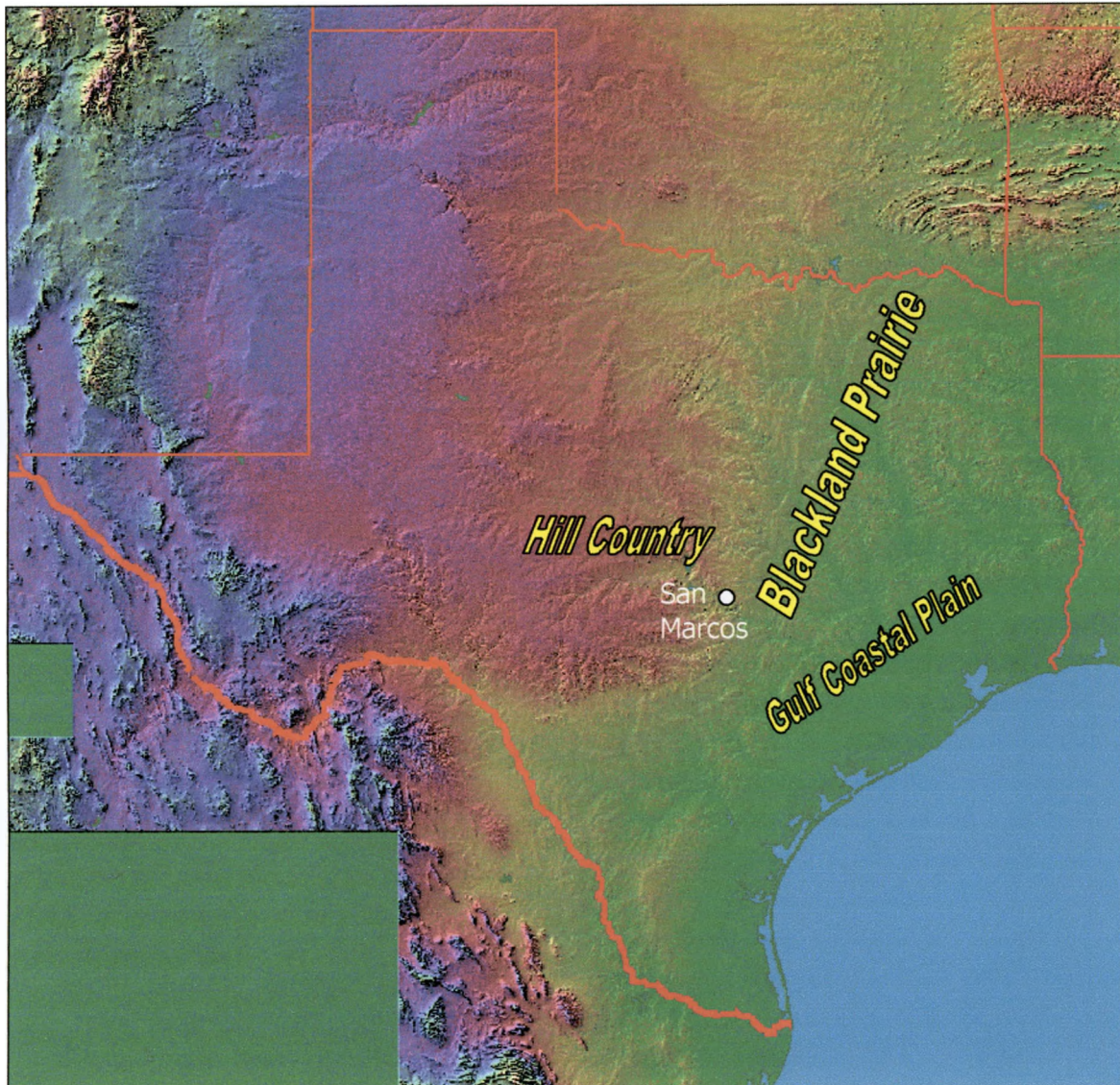


Figure 6. Shaded relief map of Texas. From the Perry Castaneda Map Collection, University of Texas: Austin, Texas.

soils seal up, prohibiting water from infiltrating through layers of soil. The numerous creeks, limestone bedrock, steep slopes, shallow soils, and clay soil composition all contribute to large amounts of runoff in small amounts of time. The climate also provides ample opportunities for large rain events from mid-latitude cyclones that move across the



continental United States, bringing fronts southward, as well as from tropical cyclones that travel through the Gulf of Mexico and along the west coast of Mexico.

In addition to the previously mentioned attributes, the confluence of the Blanco and San Marcos Rivers is located just south and east of San Marcos. This junction contributes to severe flooding problems for San Marcos in addition to those just outlined in the above discussion of Hill Country characteristics. Figure 7 shows the location of the two rivers and their confluence in relation to the City of San Marcos.

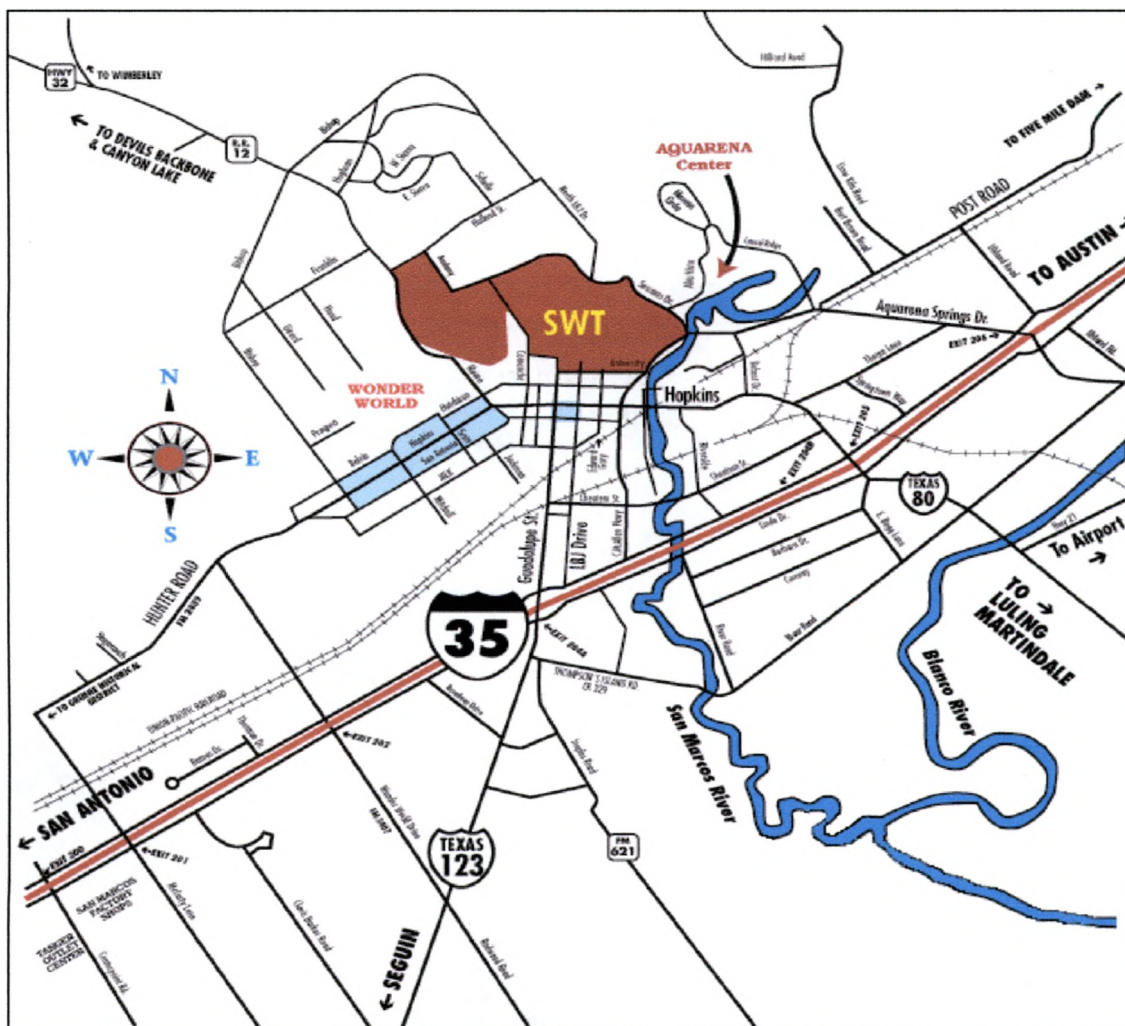


Figure 7. Map of the City of San Marcos, the Blanco River, and the San Marcos River. From the City of San Marcos internet site.

## **The Human Geography of San Marcos**

Settlements have existed on the San Marcos River since the early 1800s (Southwest Texas State University 1996). Originally nicknamed the “River of Innocence,” it has repeatedly overrun its banks due to the area’s propensity toward flash flooding. Early establishments along the river weathered many floods and rebuilt time after time. The flood hazard in San Marcos still plagues residents to this day. The City of San Marcos has grown to an estimated 42,201 residents (San Marcos Chamber of Commerce 2000). The total population has increased 46.8 percent since the 1990 U.S. Census. The 2000 census estimates expect the Hispanic and Anglo populations to be within a few percent of each other, comprising of 45.5 percent and 48.6 percent of the total population, respectively. Figures 8 and 9 provide the spatial distribution of Hispanic and Anglo populations in San Marcos in relation to the San Marcos and Blanco rivers. The changes in diversity within the community challenge emergency planners in taking appropriate and effective actions in all phases of the “Disaster Life Cycle.”

## **Emergency Management in San Marcos**

The City of San Marcos has undertaken numerous structural and non-structural measures to control flooding in San Marcos. City ordinances and zoning practices restrict and guide development within the San Marcos River floodplain. Further, the city has constructed several channel improvements and built five flood control dams. These measures have reduced the amount of damage to property from flooding. However, this does not leave San Marcos immune to flooding. Residents and officials must still prepare

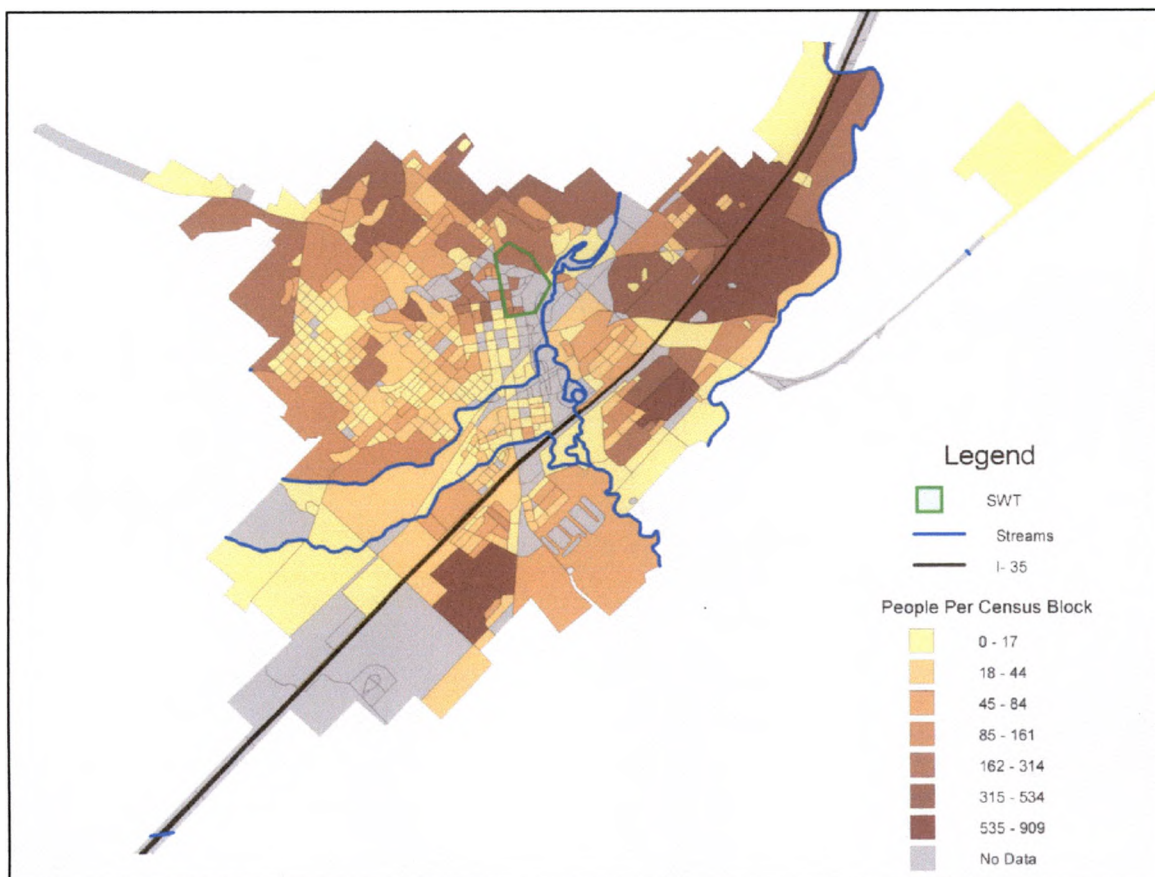


Figure 8. Map of San Marcos' Anglo population by census block. From Horel, Scott. 1999. "Flood Risk in San Marcos," Blanchard-Boehm, R.D. (ed.) in *Hill Country Flood of 1998: A Comprehensive Study of the Impact on San Marcos*. Department of Geography, Southwest Texas State University. Unpublished report.

for major flood events such those that occurred in 1970 and 1998. Table 3 (on page 41) lists previous flood events in San Marcos.

In the early 1980s, the City of San Marcos adopted an "All-Hazard Emergency Plan" recommended by the Federal Emergency Management Administration (FEMA) (O'Leary 1998). The current plan, adopted in 1997, is a revision of the early framework (City of San Marcos 1997). The mayor serves as head director of emergency planning. The emergency management plan calls for an Emergency Operations Center (EOC) to be activated during disaster situations. City officials relocate to the EOC (housed at the San

Marcos Police Department) to coordinate response efforts during a disaster.

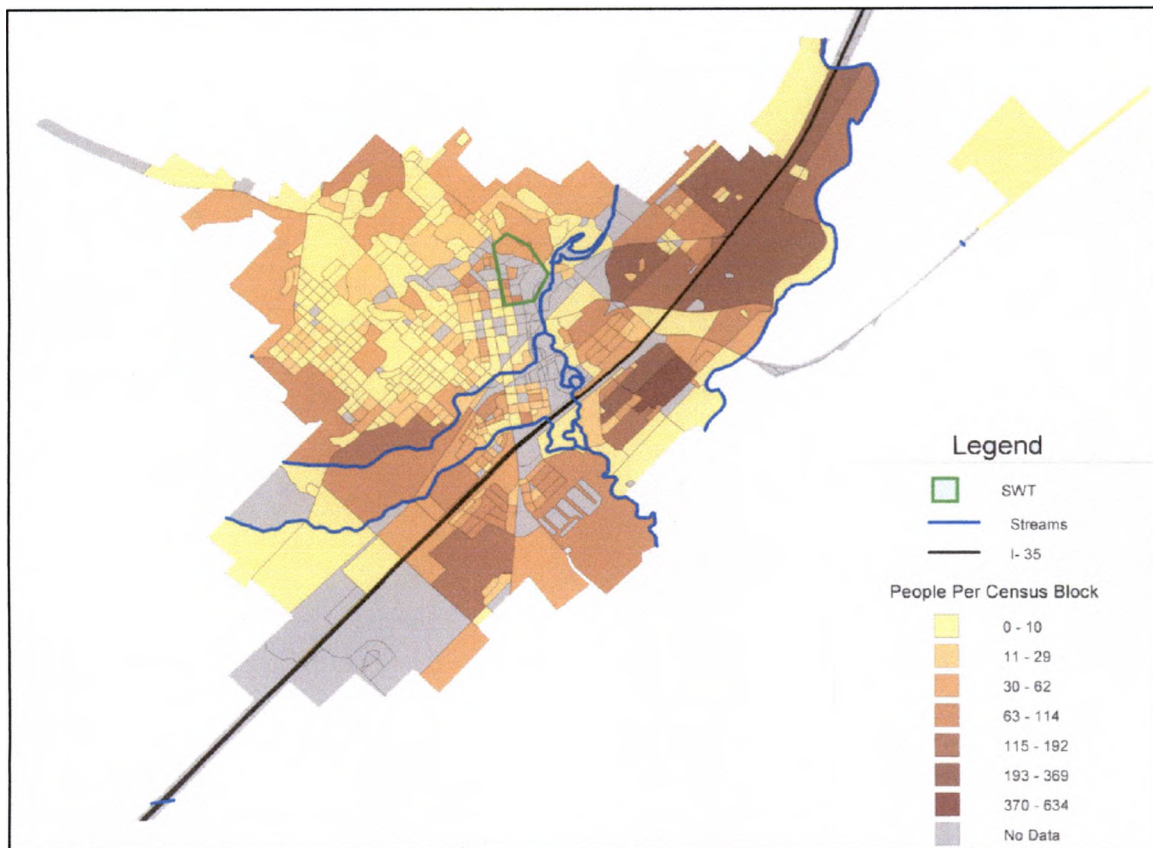


Figure 9. Map of San Marcos' Hispanic population by census block. From Horel, Scott. 1999. "Flood Risk in San Marcos," Blanchard-Boehm, R.D. (ed.) in *Hill Country Flood of 1998: A Comprehensive Study of the Impact on San Marcos*. Department of Geography, Southwest Texas State University. Unpublished report.

### **Risk Communication in San Marcos Emergency Planning**

Under the "All-Hazards Emergency Plan," responsibilities related to risk communication are as follows: 1) warnings - fire chief; 2) communications - chief of police; and, 3) emergency public information - public information officer. Warning responsibilities include disseminating emergency information, passing on warnings to the public and city officials, and maintaining "Warning Annex A," of the *Standard Operating*



Table 3. Top seven floods of the San Marcos River by discharge

Date of Flood	Rank	Discharge Records (USGS) ft <sup>3</sup> /sec
1921	1	97,000
1970	2	76,700
1981	3	59,000
1958	4	45,000
1998	4	45,000
1972	6	35,000
1957	7	34,000

Source: Burkett, April. 1999. "A Century of Floods on the San Marcos River," Blanchard-Boehm, R.D. (ed.) in *Hill Country Flood of 1998: A Comprehensive Study of the Impact on San Marcos*. Department of Geography, Southwest Texas State University. Unpublished report.

*Procedures.* The chief of police is required to establish and maintain communication systems, coordinate communication during the emergency (including private, public, and EOC) and maintain "Communications Annex B," of the *Standard Operating Procedures*. The public information officer is responsible for hazard awareness programs, distributing emergency information to the public, acting as a liaison to the media, documenting disaster events, and maintaining "Emergency Public Information Annex I," of the *Standard Operating Procedures*.

In educating the public of hazards, city emergency officials conduct mock disaster drills several times a year. These drills involve volunteer victims from San Marcos residents (Millecam 1999). The most widely venue for educating the public about future disasters and how to prepare is the local newspaper. The city also occasionally conducts public education courses and school programs (O'Leary 1999).

### **Example of Risk Communication in San Marcos, Texas**

In October 1998, San Marcos residents experienced what some experts refer to as a 500-year flood event. In that event, approximately 22.5 inches of precipitation fell within a 36-hour time period. Over 723 homes in San Marcos sustained damage, and the dollar losses in the city amounted to well-over \$12 million.

Emergency planners and flood victims generally agree that inadequate communications hampered flood efforts during the October 1998 flood. During recovery after the flood, city council members delivered public information packets to San Marcos residents. Residents were informed of insurance procedures, clean-up instructions, relocation information, food management issues, and important phone numbers (O'Leary, 1999). Since the flood, planners and residents have discussed establishing a San Marcos radio station that would be used only during disasters to aid in closing the communication gap. However, efforts to date have not yielded such an establishment.

The 1998 major flood event indicated that risk communication in San Marcos is strongest during the *recovery* stage of a disaster. The communication breakdown and confusion during the flood event exposed weaknesses in the risk communication division of San Marcos City's emergency planning. These weaknesses appear in the *mitigation*, *preparation*, and *response* stages of the disaster. If the city and residents had undertaken mitigation measures prior to the flood, the cost of damage would have been reduced. Preparing the city and its residents by having evacuation plans and appropriate networks for disseminating information would have abated the breakdown and confusion. An established warning system would have also decreased the communication barriers faced during the *response* stage of the flood.

The following chapter describes methodology used in this research to assess the differences between the two major ethnic groups in San Marcos. The results from this data collection and analysis will assist the above-mentioned officials responsible for emergency management and disseminating warnings to San Marcos residents.

## **CHAPTER IV**

### **STUDY DESIGN**

This study utilizes survey methodology to gather data to measure and interpret personal risk perceptions, attitudes and actions toward risk communication, and disaster behavior of San Marcos, Texas residents who have experienced severe weather or flooding in San Marcos. Interviewers gathered data through a telephone survey of San Marcos residents. This chapter discusses the details of the study design in the following sections: Selection of Subjects, and Data Collection.

#### **Selection of Subjects**

An initial database of 300 individuals was drawn by stratified random sampling. The *San Marcos, November 1999, Telephone Directory* served as the source for names, addresses and phone numbers in the database. After deleting businesses from the sample, the study placed each resident of San Marcos listed in the directory into one of the ethnic categories of Anglo, Hispanic, or other. Because this study was limited to the Anglo and Hispanic populations, non-Anglo and non-Hispanic residents were categorized as “other.” Surname origin provided the basis of selecting participants for this study. Marin and Marin (1991) suggested using multiple surname lists for selecting Hispanic surnames

from a directory in order to increase the accuracy of identification. Additional sources were consulted including the “1990 Passel-Word Hispanic Surname List,” the *Encyclopedia Heraldica y Genealogica* by Atruro Garcia Carraffa, and the *Diccionario Historico, Genealogico y Heraldico de las Familias Ilustres de la Monarquia Espanola* by Luis Vilar Y Pascual (Platt 1996; United States Census Bureau 1990). After creating the two lists of names, the selection process chose every twentieth name to the participant pool. A total of 150 residents comprised each list -- Anglo and Hispanic -- thus, creating 300 entries for the database.

### **Data Collection**

Data was collected by utilizing a telephone survey following the Total Design Method (TDM) by Don Dillman (1978). The telephone survey method was selected as opposed to a mail survey or face-to-face interviewing due to cost considerations, faster time efficiency, greater interview flexibility, and the potential for high response rates. Thus, quality data was obtained on a limited time schedule and a small budget. The remainder of the “Data Collection” section discusses two main factors that affected the telephone survey’s success: 1) questionnaire development; and, 2) interviewer selection and training.

### **The Survey Instrument**

The survey instrument consisted of a notification letter to respondents, as well as the questionnaire that guided the interviewers in the telephone contact. Several measures helped avoid possible problems from surprise telephone calls to participants and from

language barriers. First, in order to reduce interruptions or surprise by an unexpected request for a telephone interview, selected individuals received a notification letter in the mail approximately one week prior to the calling, which explained and gave background to the research project. Respondents also had the option to request a letter and complete an interview in Spanish. Later sections of this chapter further explain these preventative measures.

The notification letter followed the same design as suggested by Dillman (1978) and as used by Blanchard (1992) in her study of long-term risk communication in the San Francisco Bay Area. Appendix A contains a sample of this letter. The Department of Geography at Southwest Texas State University (SWT) provided letterhead and envelopes for the notification letters. The letter informed selected participants of the study topic, sponsoring agents, and research procedures. The participants were provided the option of asking for additional information about the project from the researchers at any time. In order to accommodate ethnic diversity, respondents were given the option of obtaining a copy of the letter in Spanish by calling the number provided to them. The instructions for calling were written in both English and Spanish. As expressed by the Hispanic Chamber, language was not expected to be a barrier since many of the Hispanics in San Marcos have learned to speak English. The Hispanic Chamber estimated that of approximately 300 participants, only about 5 to 10 respondents would not know how to speak English. This represented only 1.7 to 3.3 percent of the sample. However, in the event that a participant was unable to speak English or preferred to communicate in Spanish, their needs and requests were fulfilled.

The questionnaire portion of the survey instrument required much time and thought in development. For telephone surveys, the questionnaire serves the purpose of not only obtaining data from participants but also of guiding the interviewer through the conversation with the participant. The format and questions that were used in this study were similar to those questions used by Dr. Blanchard in a longitudinal study of risk communication in the San Francisco Bay Area (1992).

### **Instrument Development**

The development of the questionnaire occurred in two phases. The first phase included constructing the actual questionnaire. During the second phase, several pre-tests determined which questions needed to be revised, refined or eliminated. Dillman (1978) divides the construction of a questionnaire into three parts. These steps concern the kind of information being obtained, decisions about the question's structure and choice of appropriate words for the questions. The information sought in this study pertained to individuals' attitudes toward severe weather and flood warnings, their behaviors during disasters, and their demographic characteristics. Attitude assessment questions followed structures as suggested by Henerson and colleagues (1987). Question formats included Likert Scale, multiple choice, and short answer. The structure of questionnaires involved the type of questions, the order of questions, and the total length of the questionnaire. This study also used close-ended and partially close-ended questions. The easier, less complex questions were asked first. Increasingly more complex questions were placed in the middle of the questionnaire, and questions pertaining to demographics were saved until last. The wording of questions also addressed issues of tone and clarity. Questions and

sentences contained clear and concise wording. To facilitate the interviewing, several of the interviewers spoke Spanish fluently. The interviews took approximately 10 minutes to complete, unless the respondent wanted to provide additional comments to the questions. A sample of the questionnaire is found in Appendix B.

Prior to calling participants, several groups of people pre-tested the questionnaire format. Several members from the San Marcos Hispanic Chamber of Commerce and approximately 12 groups of graduate students from the Department of Geography at Southwest Texas State University conducted mock interviews focusing on clarity, length and tone of the questionnaire. Prior to calling selected individuals, interviewers contacted their family and close friends to practice interviewing and to further test the questionnaire.

### **Interviewer Selection and Training**

The selection of and training for interviewers was equally important. A study might have a well-developed, high quality questionnaire, but if the interviewer is not capable, or does not know how to properly present the information to the participant, the data has a greater chance of containing biased and incomplete answers. Various requirements guided the selection of interviewers. Characteristics that Dillman (1978) suggested to consider included: 1) the ability to read questions fluently; 2) interviewer's voice; and, 3) their ability to respond to participants' questions. Other criteria considered for this study were social skills, organization, and linguistic capabilities. The study employed six interviewers, several of who spoke Spanish. These interviewers were either members of Gamma Theta Upsilon, the Geography Honors Society, or graduate student assistants from the Department of Geography. A couple of weeks prior to calling



respondents, interviewers received training regarding the handling of questions, notating the call log, maintaining a professional yet warm and friendly atmosphere, and recording responses. Interviewers obtained a packet with sample interview materials several weeks prior to calling in order to familiarize themselves with the questionnaire and its procedures, and to practice and perfect the interview process (see Appendix C). All of these steps in developing the instrument and recruitment of interviewers aided in the success of this study.

The next two chapters discuss the results of the telephone survey. Chapter V provides a descriptive analysis of variables within the “General Risk Communication Model”. Chapter VI utilizes an inferential statistical test, “the Wilcoxon Signed Rank Test,” to determine which of the study variables were statistically significant in explaining the process of risk communication.

The last chapter draws conclusions from Chapters V and VI about the role of ethnicity within the risk communication model. The research questions posed in Chapter I are reintroduced and discussed further. This study ends with suggestions for practical applications towards emergency management planning in San Marcos, and elsewhere.

## **CHAPTER V**

### **DESCRIPTIVE ANALYSIS**

This chapter presents an introductory statistical analysis of survey data that pertains to the four main components of the “General Risk Communication Model”: receiver characteristics, message characteristics, receivers' response to warning messages, and receivers' perceptions of risk. This study focused on “ethnicity” found in the “receiver characteristics” component of the model and assessed how it interacted with and influenced the other three components. Message characteristics included channel use and effectiveness and source credibility. The study explored receivers' behaviors towards disseminated warning information by investigating the various actions taken by residents in seeking disaster preparation information and their actions taken after hearing a warning message. The survey evaluated receivers' perceptions of risk through an assessment of receivers' views of the likelihood of future occurrences and views of personal vulnerability to risk. Appendix D lists and describes each of the variables within the four main components.

This chapter examines the variables of the four components in two main sections -- 1) characteristics and behavioral trends of the sample population, and 2) characteristics

and behavioral trends of Anglos and Hispanics. Chapter VI further explores these results with statistical tests that determine the significance of these trends.

## **Results of Data Collection**

### **Demographics and Experience of Sample Population**

The interviewers contacted respondents by telephone over a three-week period. From the list of randomly selected participants, interviewers were able to complete 31 telephone surveys from Anglo respondents and 19 from Hispanics. Because of the low number of Hispanic responses, the data collection was supplemented by in-person surveys completed by attendants of a town meeting and by individuals that were contacted through community organizations, thus bringing the amount to 29 Hispanic respondents. This was necessary to ensure meaningful results from statistical comparisons of the two groups in the following chapters.

The sample population consisted of 51.7% Anglo and 48.3% Hispanic, which was representative of the U.S. Census' estimates for the San Marcos population - 48.6% and 45.5%, respectively (see Figure 10). In this sample, male respondents accounted for 56.7% of the population and females for 43.3%. All respondents have attained a high school diploma or a GED. Over half of the sample population continued its academic career at an institution of higher education with 21.7% attending a 2-year college, 30% a 4-year college, 3.3% graduate school, and 8.3% post-graduate school. The median age of respondents fell around 40 years old, with large concentrations of the sample population being in their 20s (38%), and in their 40s (23%). The U.S. Census 2000 estimates that, for the San Marcos population, approximately 28% of the population is in their 20s, and

13% in their 40s, which was also respective of the sample (San Marcos Chamber of Commerce 2000).

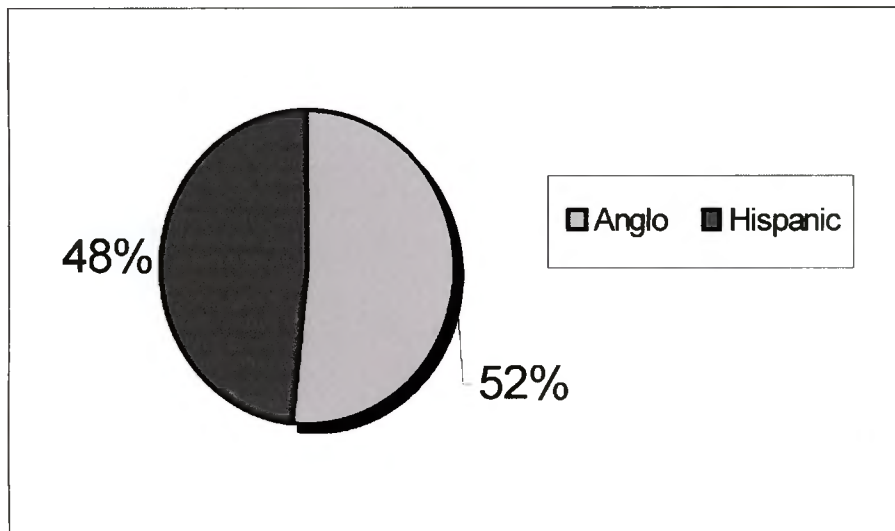


Figure 10. Ethnicity of the sample population.

Other important factors to consider included participants' exposure to and experiences with flooding, severe weather, and emergency warnings associated with these conditions. The average length of residence for respondents was 15 years, with 25% of the sample population living in San Marcos in the range of 5 to 10 years. These respondents, on average, lived 3 miles from either the San Marcos or the Blanco River, with 36% of this sample residing within a mile of one of the rivers. Many of the participants in this study had many previous experiences with flooding and severe weather events in San Marcos: 45% have had to evacuate, 40% have had property damage, 40% felt their safety had been threatened, and 82% were in San Marcos during the 1998 Central Texas floods.

The next portion of this chapter describes the overall trends of respondents with receiving warning messages, responding to warning information, and perceiving likeliness and vulnerability to risk.

### **Behaviors and Attitudes of Sample Population**

**Message Characteristics.** Interviewers asked respondents to rank the frequency of use of and the effectiveness of five different channels for information dissemination -- television, radio, friends and family, computer, and observing. Overall, respondents referred to television and observing most frequently and judged them as the most effective of the five mediums. Computer, or internet, and radio appeared as the least frequently used channels with 63% and 22% of respondents, respectively, never consulting these channels for emergency warning information. Table 4 gives the percentages of respondents that used each of these mediums all the time or frequently and that rate these mediums as effective ways of hearing warnings.

Table 4. Frequency and effectiveness of various channels\*

Channel	Channel Consulted Frequently or All the Time	Rated Channel as Somewhat or Very Effective
Television	96.7	90.0
Radio	31.7	60.3
Friends/Family	40.0	56.7
Computer	23.3	41.7
Observations	63.3	68.4

\* Numbers are reported in percentages.

When receiving warning information from television and radio, 72% of respondents watched television stations from both San Antonio and Austin, and 38%

listened to radio stations from both cities, with another 32% listening to Austin radio stations only. Of these respondents, 80% watched The Weather Channel. Only 10% of respondents used a special weather radio. The percentage of people preferring local television (92%) as a channel for warning messages reinforced these behavior patterns. Participants tended to prefer three other methods as well, though the percent was not as high as for television. These methods included phone ringing automatically with a warning message, local radio, and siren in the community. Figure 11 displays the percentages of respondents preferring each of these methods for warning information dissemination.

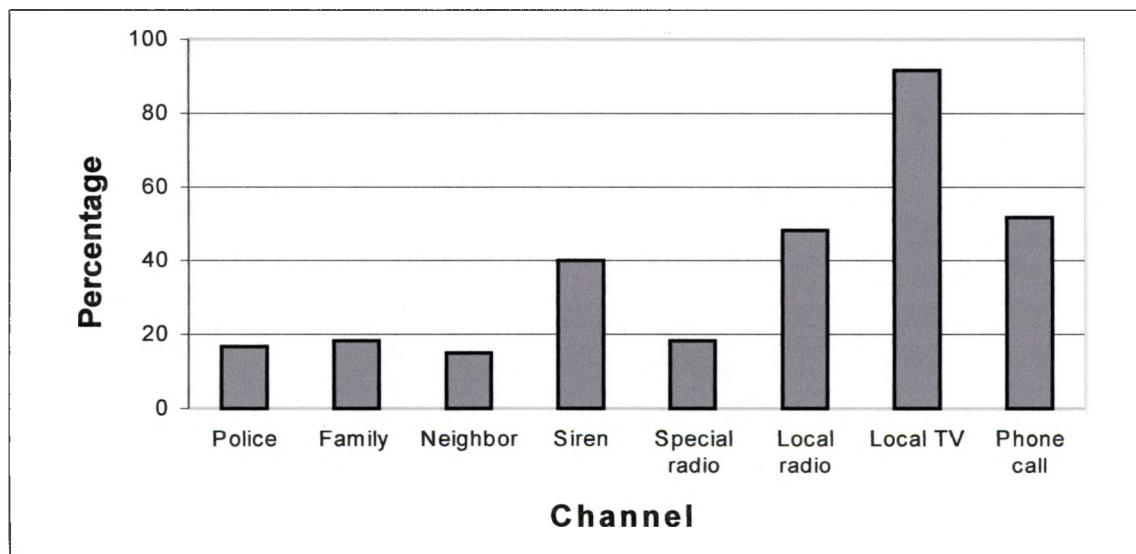


Figure 11. Channel preference of respondents for receiving warning messages.

Message characteristics also included questions related to the credibility of the message source. Sources that the majority of respondents considered trustworthy were: the National Weather Service (98%), meteorologists (88%), television stations (85%), radio stations (73%), the American Red Cross (68%), friends and family (65%) and, neighbors

(52%). Sources not viewed as trustworthy consisted of emergency personnel (48%) and government officials (40%) (see Figure 12).

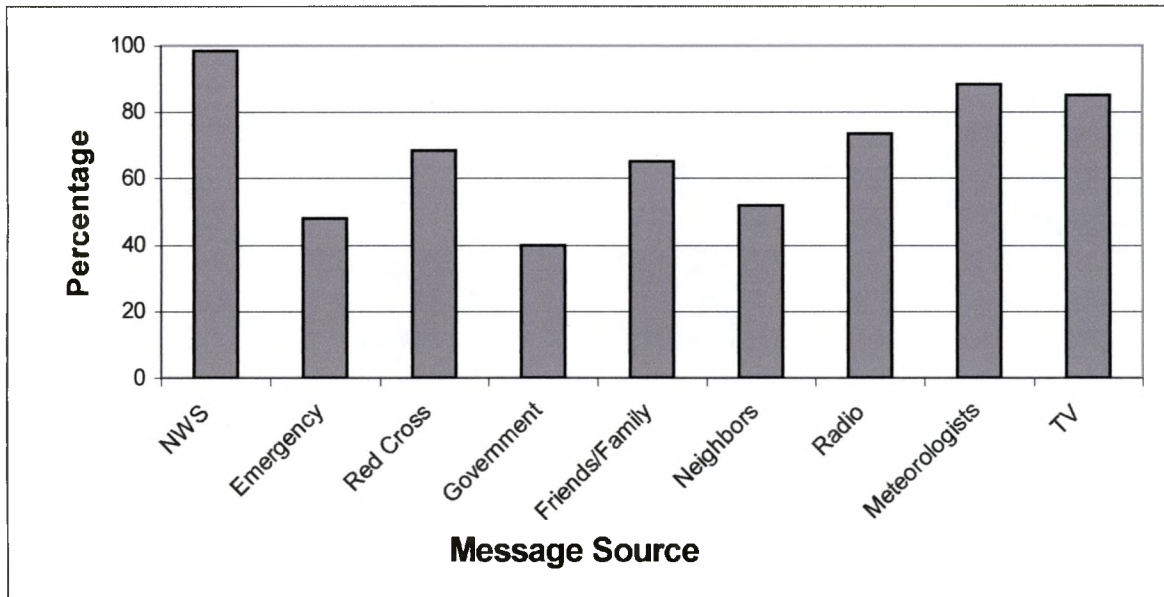


Figure 12. Respondent opinions of which sources are trustworthy.

**Receivers' Responses.** This study looked at two actions associated with respondents seeking disaster information and ten actions commonly taken in response to warnings of an immediate danger. Of the participants, 55% indicated that they read pamphlets or newspaper inserts on disaster preparedness, and 50% distinguished whether they lived in the 100-year flood plain or not.

The ten actions that were examined included listening to the radio, taking cover, staying awake until danger is past, calling others, locating family, continuing to call others, seeking updates, protecting home, stockpiling food, and moving to a safer location. The majority of the sample population generally did not engage in calling others about dangerous situations, continuing to call others during the event, stockpiling

food and water, nor moving to a safer location. Figure 13 illustrates the percentages of respondents that did, or did not, participate in each of these actions.

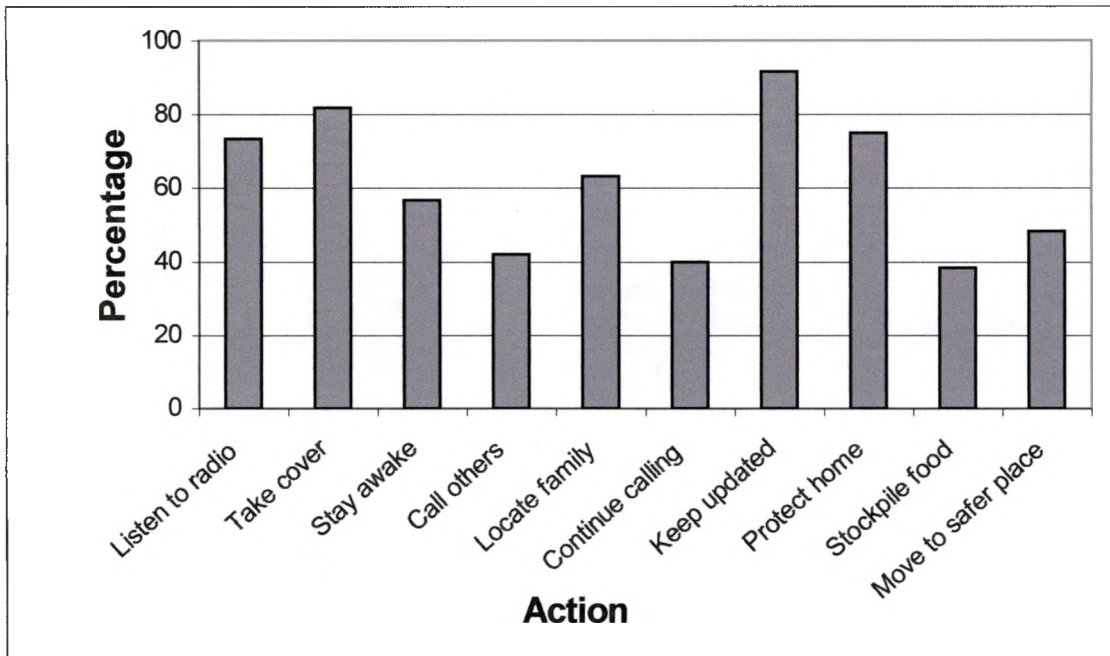


Figure 13. Responses of respondents to disseminated warning messages.

**Receivers' Perceptions of Risk.** Perception of personal vulnerability towards future occurrences was generally consistent across a variety of variables. Respondents ranked the likeliness of four independent scenarios occurring over the next ten years. The majority viewed the first two scenarios, the occurrence of any disaster and the occurrence of an October 1998-type flood, as “somewhat likely” (90%) or “very likely,” (70%). More diverse opinions were expressed about the likeliness of future damage to their homes and the likeliness of a future threat to their safety. Forty-five percent of the sample population felt that future damage was “likely,” while 52% thought that their own personal safety was threatened.



A series of statements about flooding and about disaster were asked regarding respondents' risk perceptions. Almost the entire sample population, (90%), disagreed with these two statements: "Now that this area has experienced a flood, no more floods will happen for a while"; and, "There is nothing I can do about floods so there is no reason to prepare for one." Ninety percent of respondents agreed that future preparations for floods are important, whereas 48% felt that preparations previously made were important. Further, forty-five percent believed that chance plays an important role in saving property and lives. Of these respondents, 73% believed their household is prepared for a flood, and 58% consider the community to be prepared for a flood. Table 5 and Table 6 summarize the overall sample population's responses to all variables that measure perceptions of vulnerability toward future disasters.

Table 5. Respondent rankings of future disasters in San Marcos\*

Event	Rank Event as Somewhat or Very Likely
Any disaster	90
An October 1998-type flood	70
Future damage to home	45
Future threat to safety	51.7

\*Numbers are reported in percentages.

The second portion of this chapter compares the similarities and differences between Anglo and Hispanic respondents. This discussion follows the organization of the GRCM -- the variables within warning message characteristics, receivers' responses to these warning messages, and receivers' perceptions to risk.

Table 6. Respondent opinions of flooding, preparing and mitigating\*

Statement	Disagree	Agree	No Opinion
Now that this area has experienced a flood, no more floods will happen for a while.	90	5	5
There is nothing I can do about floods so there is no reason to prepare.	85	11.7	3.3
Any preparations I make for floods will play an important part in saving my life or property in the future.	5	90	5
Preparations I made in the past played an important part in saving my life or property during a flood.	25	48.3	26.7
Chance or luck will play an important part in saving my life or property during a flood.	48.3	45	6.7

\* Numbers are reported in percentages.

### Demographics and Experience of Respondents: Anglo and Hispanic

Characteristics of gender, education, and age for Hispanic and Anglo respondents had similar distributions as the overall sample. Males comprised about 61% of the Anglo population and 52% of the Hispanic population. Females represented 39% of the Anglo population and 48% of the Hispanic population. Both Hispanic and Anglo respondents had a median education level of a two-year college. Approximately, 55% of Hispanics and 48% of Anglos continued their formal education after obtaining a high school diploma. Age distributions of Anglos and Hispanics contained a difference for the age group 40-49, with 16.1% of Anglos and 31% of Hispanics belonging to this age group. Table 7 shows the comparison of Anglo, Hispanic, and overall demographic characteristics.

Demographic measures of experience for respondents included -- length of residence in San Marcos; distance from river; past evacuation behavior; property damage

from previous flooding; experience with severe weather; threats to safety from flooding or severe weather; and, experience with 1998 Central Texas floods. The average length of residence in San Marcos was 10.5 years for Anglos and 20.8 years for Hispanics. On average, Hispanic respondents lived 2.3 miles from the river, while Anglos lived 3.6 miles from the river. The median and mode distances from the river for Anglo respondents were three miles and five miles, respectively. However, for Hispanic respondents the median was 1.5 miles and mode, 2 miles.

Table 7 . Demographic characteristics of sample population by ethnicity\*

Demographic Characteristic		Anglo	Hispanic	Total
Gender	Male	61.3	51.7	56.7
	Female	38.7	48.3	43.3
Education	High School	38.7	34.5	36.7
	Two-year College	16.1	27.6	21.7
	Four-year College	32.3	27.6	30.0
	Graduate School	0	6.9	3.3
	Post Graduate Work	12.9	3.4	8.3
Age	Under 19	0	3.4	1.7
	20-29	35.5	41.3	38.3
	30-39	12.9	6.9	10
	40-49	16.1	31	23.3
	50-59	16.1	6.9	11.7
	60-69	9.7	6.9	8.3
	Over 70	9.7	3.4	6.7

\*Numbers are reported in percentages.

A slightly higher percentage of Hispanic respondents over Anglos felt that their safety was threatened in the past by flooding or severe weather events in San Marcos. The variables of evacuation, damage, and 1998 floods for Hispanic and Anglo respondents had values within 6% of each other (see Table 8).

Table 8. Flood and severe weather experiences of sample population by ethnicity\*

Experience	Anglo	Hispanic	Total
Have evacuated	41.9	48.3	45.0
Property damaged	38.7	41.4	40.0
Safety threatened	35.5	44.8	40.0
Flood 1998	80.6	82.8	81.7

\* Numbers are reported in percentages.

### **Behavior and Attitude of Respondents: Anglo and Hispanic**

This portion of the study reports on the variables related to behavior and attitude.

Message characteristics included: frequency of listening to radio; frequency of observations; radio stations used; effectiveness of television; effectiveness of radio; message channel preference; and, trustworthiness of sources. A large difference in percentages was found between Anglo and Hispanic respondents in seeking disaster information, that is, by reading educational materials. Also, differences were noted in three of the response activities -- listening to radio, taking cover, and stockpiling food and water. In addition, differences in risk perceptions of their vulnerability toward future events are found in receivers' opinions of likeliness of the following: an October 1998-type flood over the next ten years; their belief of whether they can do something about flooding by preparing; and, their belief that chance is important in saving lives and properties. The following discussion delineates and illustrates the specifics of these differences between the two ethnic groups.

### **Message Characteristics**

Message characteristics of importance mainly pertained to message channel and message source. Of the channels, radio had the greatest disparity in responses. These

differences occurred in frequency of use, effectiveness, and in the location of radio stations. Hispanic respondents tended to consult the radio for warnings more frequently than Anglos, viewed radio as a more effective channel, and listened to radio stations from both Austin and San Antonio (about 55%), while only 23% of Anglos listened to radio stations from both Austin and San Antonio. About 45% of Anglos listened to radio stations only from Austin. Anglo respondents relied on making their own observations about weather and flooding for warning information more frequently than Hispanic respondents. When examining the effectiveness of television, both Anglo and Hispanic respondents believed that television was the most effective medium. However, Hispanic respondents tended to have a stronger opinion of its effectiveness than Anglos did -- approximately 79% of Hispanics rated television as "very effective," in comparison to only 55% of Anglos. About 36% of Anglo respondents judged television as "somewhat effective," as opposed to only 10% of Hispanics. Table 9 gives the percentages of Anglo and Hispanic respondents for each of these variables.

Table 9. Differences between Anglo and Hispanic respondents in their interaction with warning messages\*

Variable	Anglo	Hispanic
Consult radio frequently or all the time	22.6	41.3
Rate radio as somewhat or very effective	58.6	75
Listen to radio stations from Austin only	45.2	17.2
Listen to radio stations from San Antonio only	16.1	6.9
Listen to radio stations from both Austin and San Antonio	22.6	55.2
Consult observations frequently or all the time	71	55.1
Rate television as somewhat effective	35.5	10.3
Rate television as very effective	54.8	79.3

\* Numbers are reported in percentages.

As shown in the table, the variables of radio frequency, radio effectiveness, observation frequency, and television effectiveness demonstrate slight differences between behaviors and opinions of Anglo and Hispanic respondents. However, large differences exist for the variable that measured radio station location.

A few slight differences also are noted for channel preferences between Anglo and Hispanic respondents; although for each of these media, the percentages are still low relative to the preferences for other channels. Hispanic respondents tended to prefer the police coming to the door (24%) over Anglo respondents (10%). Hispanic respondents also had a propensity to prefer special weather radios more than Anglos -- 24% to 13%, respectively. Surprisingly, Anglos favored networking with family members slightly more (26%) than Hispanic respondents (10%). Figure 14 illustrates the differences between Anglo and Hispanic respondents in channel preference.

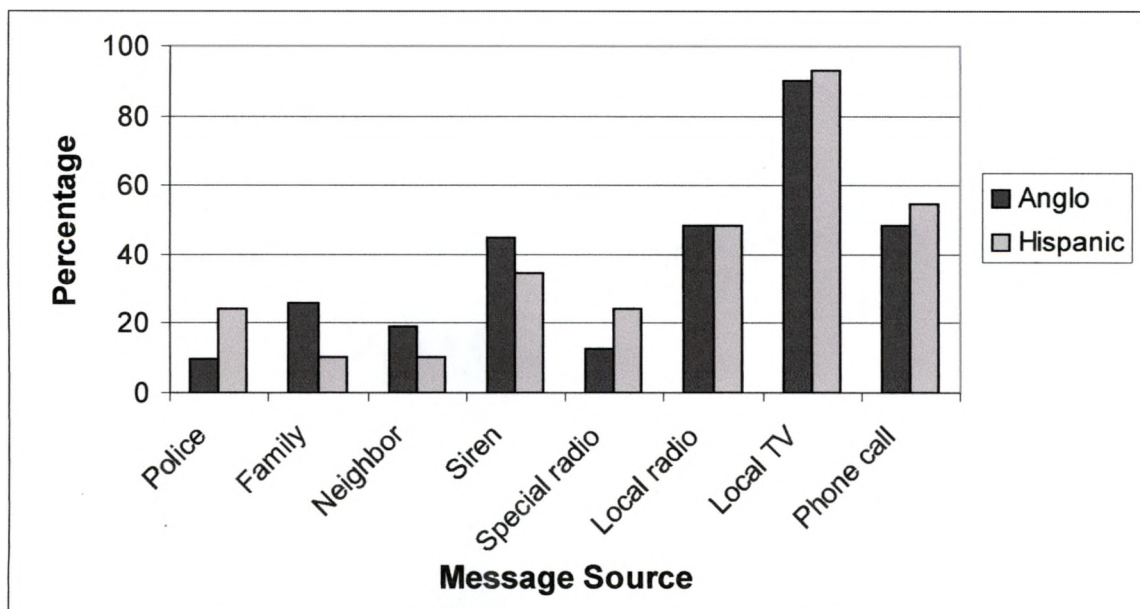


Figure 14. Channel preferences of Anglo and Hispanic respondents for receiving warning messages.

Some of the largest differences between Anglo and Hispanic respondents appeared in views of trustworthiness of message sources. Approximately 48% of Anglos indicated that they trust government officials, while only about 31% of Hispanics felt this way. The greatest discrepancies regarding trust in warning pertained to friends/family -- Anglo respondents with 81% outweighed Hispanics with 45%. Similarly, the percentage of Anglos trusting neighbors (71%) was over the percentage of Hispanic respondents (31%). Figure 15 displays the differences between Hispanic and Anglo respondents in their opinions of trustworthy sources.

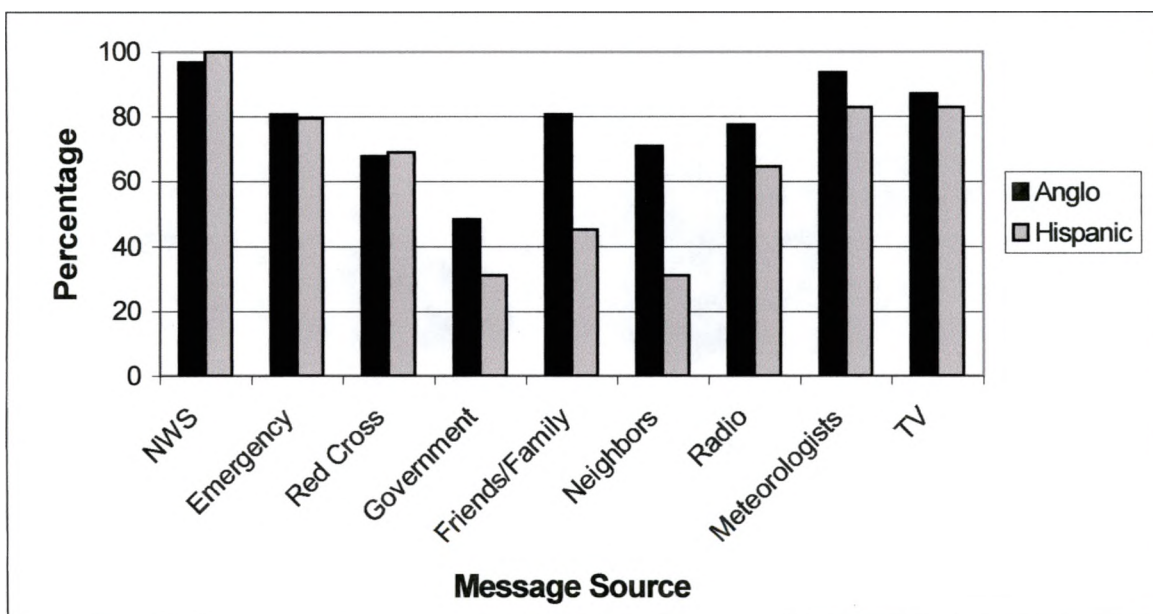


Figure 15. Anglo and Hispanic respondent opinions of which sources are trustworthy.

### Receivers' Responses

Differences were noted between Hispanic and Anglo respondents on three actions: listening to the radio; taking cover; and, stockpiling food and water. About 81% of Anglo respondents indicated that they have listened to the radio; 90% claimed that

they had taken cover; and, 48% said they had stockpiled food after hearing a warning message. The percentage of Anglo respondents exceeded the percentage of Hispanics taking these actions, 66%, 77%, and 28% respectively. However, Hispanic respondents took more action in reading educational materials about disaster preparedness -- 65% as compared to 45% of Anglo respondents. Further, only about half of the respondents were aware of their location in relation to floodplains. Fifty-seven percent of Hispanic respondents and 43% of Anglos were unsure of whether or not they lived in the 100-year floodplain. Figure 16 gives the differences between Anglo and Hispanic respondents to disseminated warning messages.

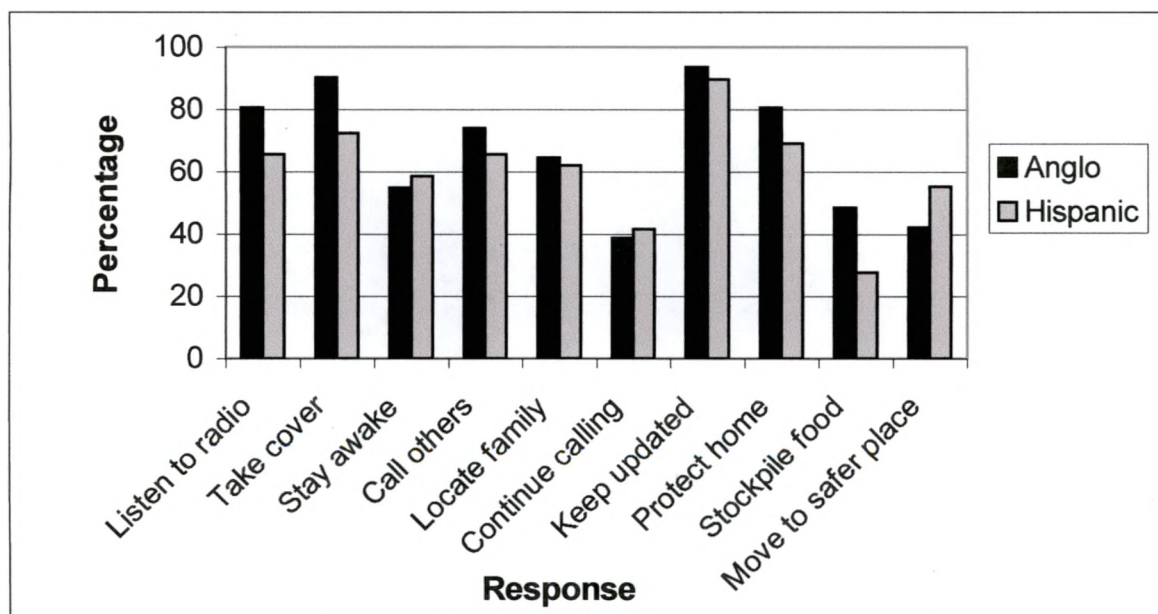


Figure 16. Responses of Anglo and Hispanic respondents to disseminated warning messages.

### Receivers' Perceptions of Risk

Anglo and Hispanic respondents' perceptions of personal vulnerability to future risk followed closely the entire sample, except for three variables: 1) rating of the



likeliness of an October 1998-type flood occurring in San Marcos in the next ten years; 2) opinion that “there is nothing I can do about floods so there is no reason to prepare for one;” and, 3) opinions that chance is an important part of saving lives and property during a flood. Approximately, 90% of Hispanic participants believed that a flood, comparable to the 1998 Central Texas flood, was “somewhat” or “very likely” to occur again over the next ten years, whereas only 52% of Anglo respondents had this same view. For the second measure, 19% of Anglos felt that there was nothing they could do about flooding, but only 3% of Hispanic respondents held this same opinion. Finally, when asked about chance or luck having a role in saving lives and property, 58% of Anglo respondents agreed this was important, in comparison to 31% of Hispanic respondents. Table 10 provides a detailed comparison of Anglo and Hispanic respondents’ attitudes towards the likeliness of personal risk towards future occurrences. Table 11 depicts differences between the two ethnic groups in their feelings towards preparing for and mitigating against future disasters.

Table 10. Hispanic and Anglo respondent rankings of future occurrences\*

Event	Hispanics Ranking Event as Likely	Anglos Ranking Event as Likely
Any disaster	89.6	90.4
An October 1998-type flood	89.7	51.6
Future damage to home	51.7	57.3
Future threat to safety	55.1	48.4

\* Numbers are reported in percentages.

By analyzing the descriptive statistics of the overall population and of each ethnic group, this chapter identified differences of behavior and attitude between Anglo and Hispanic respondents. Important variables of message characteristics included radio

station location, effectiveness of television, and frequency of radio use. A large difference between Anglo and Hispanic respondents also existed in preference for and trust in friends/family and neighbors. Respondents' behaviors of listening to the radio and stockpiling food were expected to have significant differences. Anglo and Hispanic respondents' perceptions of vulnerability to future occurrences had two important measures with differences: rating of likeliness of an October 1998-type flood and the role of chance or luck in saving lives and properties.

Table 11. Hispanic and Anglo respondent opinions towards flooding, preparing and mitigating\*

Statement	Hispanic			Anglo		
	Disagree	Agree	No Opinion	Disagree	Agree	No Opinion
Now that this area has experienced a flood, no more floods will happen for a while.	89.7	3.4	6.9	90.3	6.5	3.2
There is nothing I can do about floods so there is no reason to prepare.	93.1	3.4	3.4	77.4	19.4	3.2
Any preparations I make for floods will play an important part in saving my life or property in the future.	6.9	89.7	3.4	3.2	90.3	6.5
Preparations I made in the past played an important part in saving my life or property during a flood.	20.7	48.3	31	29	48.4	22.6
Chance or luck will play an important part in saving my life or property during a flood.	58.6	31	10.3	38.7	58.1	10.3

\* Numbers are reported in percentages.

The next chapter further explores these variables to determine if apparent differences between these groups are statistically significant.

## **CHAPTER VI**

### **STATISTICAL ANALYSIS**

This chapter utilizes the Wilcoxon Signed Rank test to determine if statistically significant differences exist between Hispanic and Anglo respondents. The Wilcoxon statistic is a nonparametric measure, used in lieu of the student t-Test, when the sample size is small, or distribution of the sample unknown. Thus the Wilcoxon test is utilized here to test the groups -- Anglo as compared to Hispanic. The analysis is organized into three main sections: message characteristics; receivers' responses to warning messages; and, receivers' perceptions of vulnerability to future disasters.

Being familiar with measurement of variables and assignment of values contributes to a greater understanding of the results of statistical tests. Data collected from telephone survey measured variables of the risk communication model through a series of questions that asked respondents to rate certain variables on a scale of "1 to 4." In these questions "4" represented the most positive end of the spectrum, for example "very effective," "very prepared" or "all the time;" and, "1" marked the negative end, such as "very ineffective," "very unprepared," and "never." Other questions asked for a "yes" or "no" answer or for

a choice from several categories. The study assigned the value of 0 to “yes” answers and of 1 to “no” answers.

### **Message Characteristics**

The following message characteristics were measured: channel frequency; channel effectiveness; television and radio station location; channel preference; and, trustworthiness of source. Respondents ranked the frequency of channel use and the effectiveness of these channels on a scale from “1 to 4,” with “4” being “all the time” and/or “very effective.” The survey collected this information for five channels -- television, radio, family/friends, computer, that is Internet, and observations. There was no statistically significant difference between Anglo and Hispanic respondents in the frequency in consulting these five sources. However, a statistically significant difference was found between the groups for the effectiveness of radio. Hispanic respondents rated the radio as a more effective means of obtaining warning information than did Anglos. Table 12 provides the means and Wilcoxon z-scores for variables of frequency and effectiveness of message channels.

For variables of television station locations and weather channel use, Wilcoxon tests showed no statistically significant difference between Hispanic and Anglo respondents. Hispanic participants differed statistically from Anglos in location of radio stations consulted for warning messages. Anglo respondents listened to radio stations from Austin, while Hispanics generally listened to radio stations from both cities. There was also a statistically significant difference between Anglo and Hispanic respondents in

greater use of weather radios. Table 13 gives the means and z-scores for each of these four variables.

Table 12. Means and z-scores for frequency and effectiveness of channel types

Variable	Hispanic Mean	Anglo Mean	Z-score
Frequency of television	3.52	3.48	.024
Frequency of radio	2.31	2.03	1.322
Frequency of family/friends	2.38	2.39	-.143
Frequency of computer	1.55	1.81	-.454
Frequency of observation	2.76	3.03	-1.029
Effectiveness of television	3.62	3.42	1.002
Effectiveness of radio	3.21	2.72	2.500***
Effectiveness of family/friends	2.68	2.61	.172
Effectiveness of computer	2.08	2.24	-.344
Effectiveness Observation	3.03	3.00	.310

\* .10 significance level

\*\* .05 significance level

\*\*\* .01 significance level

Table 13. Means and z-scores for channel location and use of channels

Variable	Hispanic Mean	Anglo Mean	Z-score
Television station location	2.52	2.52	.060
Radio station location	2.93	2.19	2.299**
Weather channel use	.17	.23	-.707
Weather radio use	.97	.84	1.732 *

\* .10 significance level

\*\* .05 significance level

\*\*\* .01 significance level

Even though the overall opinion of effectiveness of television between Anglo and Hispanic respondents showed no statistically significant difference, a statistically significant difference was found between the groups when examining the strength of opinion of the effectiveness of the channel. A separate analysis was performed on the difference between Anglo and Hispanic respondents in their view of television being

“somewhat effective,” a value of “0,” or “very effective,” a value of “1.” The mean score for Hispanics was .88 and for Anglos was .61. The Wilcoxon test indicated that these means were statistically significant at the .01 level.

In the telephone interview, respondents chose three ways, out of a list of eight, of greatest preference in receiving warning messages. Hispanic and Anglo respondents showed a statistically significant difference in preferring neighbors as a means for receiving warning messages. No other statistically significant differences for channel preference were found in the statistical analysis of these variables (see Table 14). The channels that respondents chose were assigned the value of 0 for “yes.” Channels not chosen as a preference were assigned the value of 1 for “no.” Means near the “0” indicated a preference for that channel, whereas a mean closer to “1” signified a channel not preferred.

Table 14. Means and z-scores of channel preference variables

Variable	Hispanic Mean	Anglo Mean	Z-score
Police coming to the door	.76	.90	-1.265
Family member	.90	.77	1.265
Neighbors	.90	.77	1.633 *
Siren in the community	.66	.55	.905
Special weather radio	.76	.87	-1.134
Local radio	.52	.52	.000
Local television	.0690	.0968	-.447
Phone call with automated message	.45	.52	-.832

\* .10 significance level

\*\* .05 significance level

\*\*\* .01 significance level

Interviewers asked participants to determine whether they trusted certain sources by reading a list of typical sources. After hearing the source, the respondents answered

“yes” (= 0) for sources they trusted or “no”(=1) for sources they did not trust. The Wilcoxon Signed-rank test demonstrated a statistically significant difference between Anglo and Hispanic respondents’ “trust” of friends/family, as well as, for neighbors. Contrary to expectations, Anglo respondents indicated a greater trust in friends/family and in neighbors than did Hispanic respondents. Table 15 summarizes the results.

Table 15. Means and z-scores for trustworthiness of message source

Variable	Hispanic Mean	Anglo Mean	Z-score
National Weather Service	0	.0323	- 1.000
Emergency personnel	.21	.19	.302
American Red Cross	.31	.30	.277
Government officials	.69	.53	1.291
Friends/family	.52	.19	2.324 **
Neighbors	.69	.26	3.500 ****
Radio	.31	.17	1.508
Meteorologists	.17	.0968	.707
Television	.17	.0645	1.134

\* .10 significance level

\*\* .05 significance level

\*\*\* .01 significance level

\*\*\*\* .001 significance level

### Receivers’ Responses

This study examined ten different responses that participants might choose upon hearing a warning message. The Wilcoxon test indicated that a statistically significant difference existed between Anglo and Hispanic respondents in “taking cover.” Apparently, Hispanic respondents took cover more than Anglos after hearing a warning message. No other variables of receivers’ responses showed a statistically significant difference between the two groups (see Table 16).



In making preparations for disasters, Hispanic respondents tended to read educational materials more than Anglos. However, there was a statistically significant difference between the groups for awareness of living in a floodplain (see Table 16).

A statistically significant difference is found between Anglo and Hispanic respondents in knowledge of whether or not they reside in a 100-year floodplain. No statistically significant difference was found between Hispanic and Anglo respondents regarding their behaviors in reading education material about disaster preparedness.

The remainder of this chapter discusses the results of statistical testing of variables of the receivers' perceptions of risk.

Table 16. Means and z-scores for responses to warning messages

Variable	Hispanic Mean	Anglo Mean	Z-score
Listen to radio	.31	.19	1.000
Take cover	.24	.0968	1.667 *
Stay awake	.38	.45	-.258
Call others	.34	.26	.535
Locate family	.38	.39	.000
Continue to call others	.59	.61	-.302
Keep updated with media	.0690	.0645	.577
Protect home or property	.31	.19	.832
Stockpile food and water	.69	.52	1.342
Move to safer location	.45	.58	-.775
Read education materials	.34	.55	-1.508
Know if live in floodplain or not	.59	.42	2.121**

\* .10 significance level

\*\* .05 significance level

\*\*\* .01 significance level

### Receivers' Perceptions of Risk

Variables of perceptions of vulnerability towards future risk included: likelihood of future event; perception of personal vulnerability to risk; and, perception of

preparedness. Participants rated their opinions of “likeliness” of a series of separate events. A statistically significant difference was found between Hispanic and Anglo respondents in their opinions about the likeliness of a future flood comparable to the 1998 Central Texas flood occurring in San Marcos over the next ten years; Hispanics believed the event as more likely than Anglo respondents viewed it. Table 17 gives the means and z-scores for the likeliness of event ratings.

Table 17. Means and z-scores of Anglo and Hispanic respondents’ rankings of future disasters

Variable	Hispanic Mean	Anglo Mean	Z-score
Any disaster	3.38	3.45	-.204
October 1998-type flood	3.38	2.55	2.666 ***
Damage to home	2.52	2.29	.733
Threat to safety	2.55	2.35	.653

\* .10 significance level

\*\* .05 significance level

\*\*\* .01 significance level

The second category, perceptions of personal vulnerability toward future occurrence, asked respondents to determine whether they agreed with a set of statements about flooding and preparedness for flooding in San Marcos. The Wilcoxon Sign-ranked test demonstrated that none of these variables were statistically significant. Table 18 presents the z-scores and means of Hispanic and Anglo agreement with the five separate statements.

Questions pertaining to perceptions of preparedness indicated that Anglo respondents felt that their households were more prepared than Hispanic respondents for a future disaster in San Marcos. No statistically significant difference was found between

the two groups with regard to their views of the community's level of preparedness (see Table 19).

Table 18. Means and z-scores for opinions of flooding, preparing and mitigating

Variable	Hispanic Mean	Anglo Mean	Z-score
No more floods	1.17	1.13	.322
No reason to prepare	1.10	1.26	-1.249
Future preparations important	1.97	2.03	-.816
Past preparations important	2.10	1.94	.995
Chance or luck important	1.52	1.65	-.626
* .10 significance level			
** .05 significance level			
*** .01 significance level			

Table 19. Means and z-scores for perceptions of preparedness

Variable	Hispanic Mean	Anglo Mean	Z-score
Household preparedness	2.62	3.03	-1.623
Community preparedness	2.50	2.61	-.863
* .10 significance level			
** .05 significance level			
*** .01 significance level			

Another variable that measured risk perception included the respondents' level of previous experience with a disaster. The Wilcoxon test signified a statistically significant difference between Hispanic and Anglo respondents in their time living in San Marcos, distance from the river, and residing within the 100 and 500-year floodplains. No statistically significant difference was found between ethnic groups for previous property damage, previous threats to safety, or experience with the 1998 floods. Table 20 provides the means and z-scores for variables indicating level of experiences. Mean values for variables of "live in 100-year floodplain" and "live in 500-year floodplain"

were based upon those respondents that had a knowledge of whether or not they lived in the floodplain.

Table 20. Means and z-scores for variables of level of experience.

Variable	Hispanic Mean	Anglo Mean	Z-score
Time living in San Marcos	20.7545	10.5645	1.763 *
Distance from river	2.2866	3.6165	-2.650 ***
Live in 100-year flood plain	.50	.94	-2.449 ***
Live in 500-year flood plain	.30	.77	-2.236 **
Past property damage	.59	.61	- .277
Past safety threat	.55	.65	- .832
Present for October 1998 floods	.17	.19	- .739

\* .10 significance level

\*\* .05 significance level

\*\*\* .01 significance level

This chapter determined the variables of the “General Risk Communication Model” that exhibited statistically significant differences between Anglo and Hispanic respondents when using the Wilcoxon Signed-Rank test. The next chapter discusses the results of the descriptive and statistical analysis of data and draws conclusions about ethnicity and its role in the “General Risk Communication Model.” Policy implications are noted, as well as, suggestions for risk communication experts.

## **CHAPTER VII**

### **SUMMARY AND CONCLUSIONS**

This chapter formulates conclusions regarding differences between Anglos and Hispanics in their behaviors and attitudes towards disseminated warning messages based on the descriptive and statistical analyses. The role of ethnicity within the “General Risk Communication Model,” is also discussed, as well as, implications of these findings upon emergency management policies and planning. The chapter begins with an analysis of variables within the GRCM and then expands to a holistic view of the model.

#### **Ethnicity and Variables of the General Risk Communication Model: A Summary**

This section summarizes the interaction of Anglo and Hispanic respondents with the three other components of the GRCM: message characteristics, receivers’ response, and receivers’ perception of risk.

##### **Message Characteristics**

Overall, results indicate that both Hispanic and Anglo respondents are similar in watching television the most, feeling that it is the most effective means of receiving

warning messages, and preferring to hear messages from this media more than any other. The descriptive analysis and statistical analysis of Anglo and Hispanic opinions of the effectiveness of television have a statistically significant difference in the strength of the channel effectiveness. A significantly larger number of Hispanic than Anglo respondents viewed the television as a “very effective” source, whereas the majority of Anglo respondents felt that television was a “somewhat effective” source.

A statistically significant number of Hispanic respondents seemed to view the radio as a more effective channel for receiving warning messages than Anglos. Although not statistically significant, a larger percentage of Hispanic respondents used the radio more frequently than Anglos. However, a larger percentage of Anglo respondents, though not statistically significant, trusted radio stations more than Hispanics. When listening to the radio, Hispanic respondents had a statistically significantly higher rate of listening to Austin and San Antonio stations than did Anglos. Anglos listened mainly to Austin stations. The location of radio stations used by Hispanic and Anglo respondents could possibly explain some of the discrepancy that Hispanics had in listening to radio more frequently than Anglos, though Anglos had a higher trust in radio stations than Hispanics.

A difference was also noted between Anglo and Hispanic respondent interactions with warning messages for the channels of family/friends and neighbors. Both Anglo and Hispanic participants showed similar behaviors in frequency of consulting family/friends and neighbors and in their opinions of the effectiveness of both of these channels. However, surprisingly, a statistically significant difference occurred for Anglo respondents in preferring neighbors as a channel source, as well as, the trust of

family/friends and of neighbors. In this study, Anglo respondents preferred to hear warning messages from neighbors more than Hispanics, and to trust friends/family and neighbors more than Hispanics. These results contradict findings of past research indicating that Hispanics tend to rely on the informal sources of social networks, while Anglos tend to rely on formal networks like the media (Drabek 1996; Fothergill et al. 1999; Perry and Lindell 1991). Thus, this study indicates that, even though both groups consult and prefer the television more than other media and sources, there is a statistically significant difference between the groups in their preferences for and trust in family/friends and neighbors. Anglo respondents seemed to favor utilizing informal sources more than Hispanics. Further, Hispanics appeared to prefer receiving warning information from the more formal channels of television and radio.

### **Receivers' Response to Warning Messages**

From the analysis of actions taken after hearing a warning message, a statistically significant difference occurred between ethnic groups for the action of taking cover or seeking protection indoors. The statistically significant z-score indicates that Anglo respondents tended to seek cover more than Hispanics upon hearing a warning message. No statistically significant difference existed for respondents in listening to radio, staying awake, calling other, locating family, continuing to call others, keeping updated with media, protecting home or property, stockpiling food, and moving to safer locations.

Some statistically significant differences were found between Anglo and Hispanic respondents in preparing for disasters. Anglo respondents showed a statistically significant greater awareness of their location in relation to the floodplain than Hispanics.

However, a larger percentage of Hispanic respondents read educational materials about disaster preparedness than Anglos.

The majority of participants from each ethnic group responded to warning messages by listening to the radio, keeping updated with the media, calling others, and protecting their home or property. Anglos had a greater tendency to take cover than Hispanics. Individuals from both groups engaged in preparations, though Anglo respondents knew more about their physical location relative to the floodplain.

### **Receivers' Perceptions of Risk**

Perceptions of vulnerability toward future occurrences for Anglo and Hispanic respondents in this study were similar, except for perceptions of the “likeliness of a 1998-type flood occurring in San Marcos over the next ten years” and in opinions of the level of household preparedness. Overall, both ethnic groups believed that a future disaster in San Marcos was very likely. However, only about half of respondents in each group felt that their home or safety would be endangered by severe weather or flooding event over the next ten years. They view the event as “likely” but not as a threat to their homes or families. Several factors might contribute to respondents’ perceptions of their personal vulnerability. Approximately 80% of the sample population were in San Marcos during the October 1998 floods, which many experts referred to as a “500-year flood.” Only about 40% though, had ever had property damage or felt that their safety was threatened by flooding or severe weather while living in San Marcos. Other variables, such as distance from the river and preventative measures taken, might contribute to this overall pattern. Hispanic respondents did, however, assign a significantly higher rating than



Anglos to the likeliness of a future October 1998-type flood occurring in San Marcos in the next ten years. In addition, a larger percentage of Anglo respondents, though not statistically significant, viewed their household as prepared than Hispanics for a future disaster. Both Anglo and Hispanic respondents appeared to disagree with the statements that “no more floods will occur for a while” and that “there is no reason to prepare.” Also, both ethnic groups agreed that future preparations were important for saving lives and property. Since the only significant difference in opinions of likeliness of future events appeared with regard to a large flood, like the 1998 Central Texas flood, this study explored the level of experiences of Hispanic and Anglo respondents.

Hispanic and Anglo respondents showed statistically significant differences in length of residency, distance from river, and location within the 100 or 500-year flood plain. Hispanic respondents tended to have a longer length of residence, had a shorter distance from the river, and there were more individuals living within a floodplain than Anglos. The study finds that these exposures to the river and flooding might cause Hispanic respondents to be more prone than Anglos to believe that a large flood is very likely over the next ten years. Hispanics may have a higher perception of the likeliness of a future October 1998-type flood than Anglos for other reasons as well, such as psychological training or social stimuli that cause an overestimation of danger or a “real” perception of dangers. However, these factors reach beyond the scope of this particular study. The only empirical evidences for other influential factors are the experience and exposure variables.

In sum, variables that were statistically significant are found in the following table.

Table 21. Variables that distinguish percentage of Anglo and Hispanic Respondents

Variable	Ethnic Group with Larger Mean
Time living in San Marcos	Hispanic
Distance from river	Anglo
Live in 100-year floodplain	Hispanic
Live in 500-year floodplain	Hispanic
Effectiveness of radio	Hispanic
Radio station location	Hispanic - Both cities Anglo - Austin
Weather radio use	Hispanic
Neighbors as channel preference	Anglo
Trust in friends/family	Anglo
Trust in neighbors	Anglo
Taking cover	Anglo
Knowledge of in floodplain	Anglo
Likelihood of October 1998-type flood	Hispanic

### Generalization of Findings

The findings from this study suggest that both Hispanics and Anglos rely on the mass media for “effective” and trustworthy warning information. However, Anglos appear to also use informal sources, such as friends, family and neighbors; whereas, Hispanics depend on mainly the formal sources such as television and radio. These findings support the claim of Perry and Lindell (1991) that ethnic groups have different perceptions as to what constitutes a “credible source.” However, the results of this study contradict previous research that found Hispanics to rely more upon informal sources of social networks for warning information and Anglos to hear warning messages from formal, English speaking sources, such as the mass media (Drabek 1986; Perry and Lindell 1991).

Both ethnic groups take some form of action in preparing for disasters and in responding to warning messages. Findings from this study also suggest Anglos are more aware of their location in relation to the hazard. Based on this study, the majority of both

Anglos and Hispanics listen to the radio, take cover indoors, call others about danger, seek information updates, and protect their home and property after hearing a warning message. Anglos seem to take cover indoors and listen to the radio more often than Hispanics. Both ethnic groups also evacuate when hazardous conditions prevail. These results further support findings of Perry and Lindell (1991) in that ethnicity does not influence evacuation compliance. The findings of this study do not confirm previous claims that minorities are less likely to evacuate than Anglos (Fothergill et al. 1999; Perry and Green 1982; Drabek 1986; Perry and Mushkatel 1984) and that Mexican-Americans tend to take protective actions instead of evacuating (Perry, Lindell and Green 1982; Perry and Mushkatel 1984).

From this study, Anglos and Hispanics appear to perceive a high chance for future occurrences of disasters. However, members of both groups seem to think that their lives and property are not in danger of these events. The results of this study imply that Hispanics have a greater perception of vulnerability to large-scale disasters when they have exposure to the hazard and experience with previous disasters. These findings add to the myriad of conflicting research results that Fothergill and colleagues reported (1999). The implications of this study are similar to those of Ives and Furseth (1983) and Aptekar, as reported by Fothergill (1999): 1) no difference between ethnic groups exists in perception of personal vulnerability to risk; and, 2) Hispanics have higher levels of perception towards future occurrences when they have had previous experiences.

### **Implications on Emergency Planning in San Marcos, Texas**

The results of this study provide information useful for emergency planners in San Marcos and elsewhere for developing risk communication programs for targeted audiences. For instance, following the flood of 1998, planners discussed the importance of establishing a radio station in San Marcos to aid in communication efforts before and during disaster events. Also, this survey indicates that television serves as a more effective means of reaching a diverse public. Both the Hispanic and Anglo respondents from the survey view the television as an effective means of receiving warning information and consult television stations regularly during times of severe climatic conditions.

This study also suggests considering warning systems that involve a siren in the community or an alert system composed of phone calls to vulnerable populations. These methods of disseminating warning messages have unique purposes designated for different disaster situations. For example, it would not be logical to have an automated phone system for warning of a tornado. This system is better suited for times of flood evacuations, whereas sirens work well for tornado warnings.

This study recommends further research of the San Marcos population in order to enhance the description of the target audience and to investigate other possible differences between the Anglo and Hispanic communities in their interactions with warning messages, responses to warning messages, and perceptions of risk so planners may tailor a warning system to the needs of the diverse population.

### **The Role of Ethnicity in the General Risk Communication Model**

As evidenced from this study and risk communication research, ethnicity has apparent influences upon variables within each of the components of the GRCM. The specific interactions of ethnicity with variables of the model seem to depend upon the target population. Previous research in the field of risk communication demonstrates that ethnicity affects: 1) the message characteristics needed for effective warning messages; 2) the responses of individuals' to these warning messages; and, 3) the perceptions of risk of individuals who receive warning messages. Because ethnicity interacts with various components of the "General Risk Communication Model," this study suggests that it be included within this overall framework. Based on results from this research, the GRCM should be modified to recognize that warning messages be created and targeted to specific ethnic audiences, and over their preferred type of channels. Each ethnic group must be studied and evaluated as its own entity for the successful communication of risk. As figure 16 illustrates, for maximum effectiveness, warning messages, whether short-term, or long-term, must be tailored to particular groups instead of disseminated over a large aggregate population.

### **Future Directions in Research**

Future research is still needed in assessing the role of ethnicity in risk communication and in identifying important factors that influence the overall framework of risk communication. The literature database for ethnicity in risk communication would benefit from research of individuals' perceptions of personal vulnerability to risk

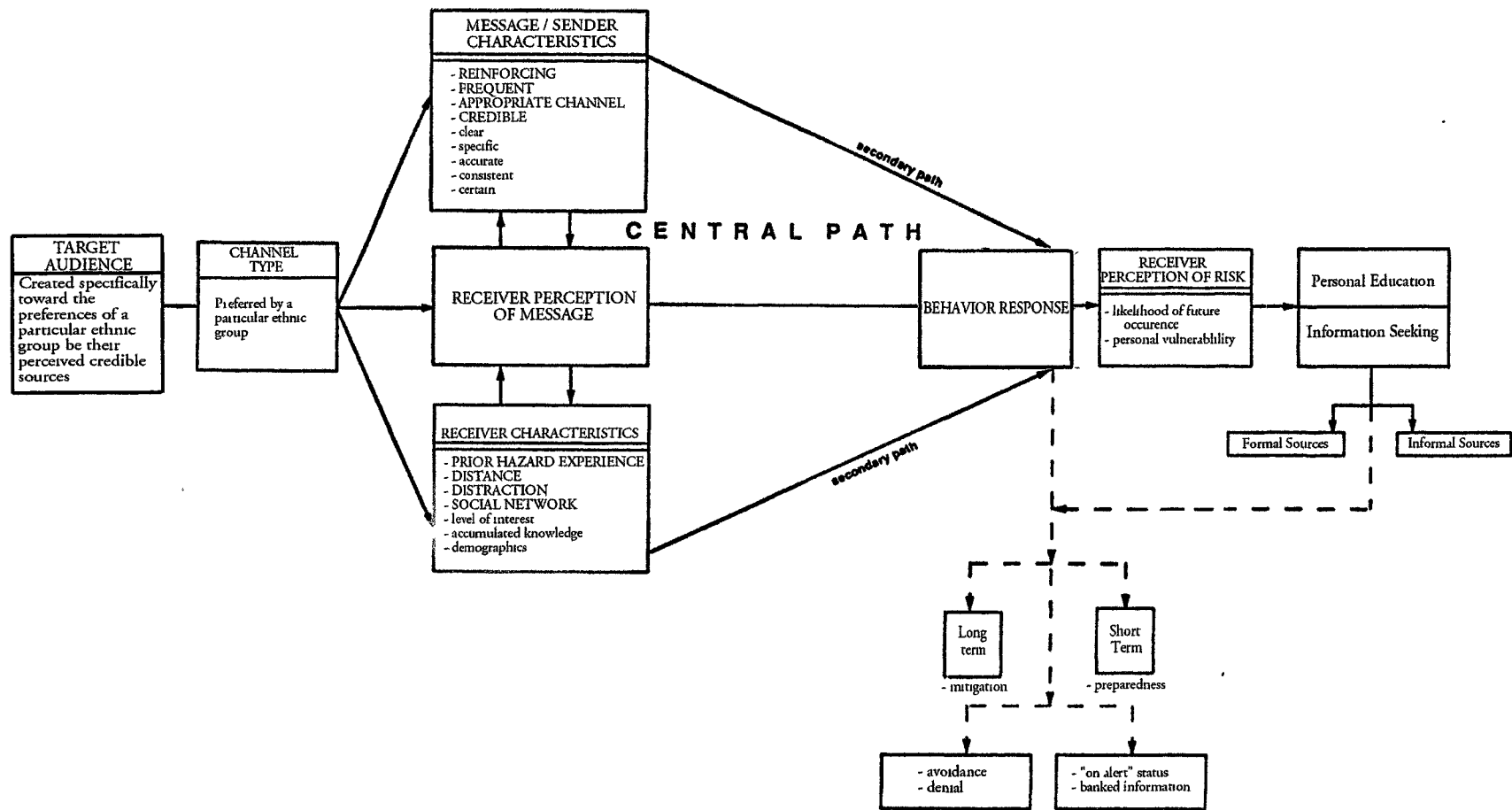


Figure 17. Recommended revisions to the General Risk Communication Model based on results from this study.

mitigation and preparation practices of different ethnic groups, receivers' perceptions of warning messages, and individuals' preferences of message sources. Issues concerning behavioral response of different ethnic groups, such as confirming warning messages and seeking shelter, are also areas needing future development.

As seen by previous research and this study, ethnicity of a target audience is an important attribute to consider in tailoring risk communication programs. However, as suggested by Handmer and Penning-Roswell's model (1990), the overall framework of risk communication encompasses cultural, political, and social attributes of a target population, as well. This study recommends future research to analyze the influence and role of these audience characteristics within the "General Risk Communication Model." Cultural characteristics to consider include social-networks and values. Political issues suggested for exploration are the receivers' political identification and beliefs, the political infrastructure of the area being studied, and the organization of emergency management within the political infrastructure. Economic status and social-class identification are attributes of social issues to be studied.

By examining groups separately, researchers identify important characteristics of a population that determine the structure and success of emergency management. By studying these attributes, emergency planners will be able to develop target audience profiles of communities and to establish effective risk communication programs.

**Appendix A**  
**Notification Letter**



APPENDIX A  
NOTIFICATION LETTER

[Department of Geography Letterhead]

October 10, 2000

John Doe  
555 N. Guadalupe  
San Marcos, TX 78666

Dear John,

Within a week or so, we will be calling you from Southwest Texas State University in San Marcos as part of a risk communication research study. This is a survey of San Marcos residents in which we are seeking your opinions about flood and severe weather warnings. We want to know about your experiences with severe weather and flooding while living in San Marcos.

We are writing in advance of our telephone call because we have found that many people appreciate being advised that a research study is in progress, and that they will be contacted. The interview will take only about ten minutes, and will be strictly on a voluntary basis. You will be able to withdraw from the interview at any time, and may decline to answer any question for any reason. If we should happen to call at an inconvenient time, please tell the interviewer, who will be happy to call back at another time. Also, we want to emphasize that your answers will be completely confidential.

This research is being organized and conducted by a graduate student, Cathryn Anderson, in the Department of Geography at Southwest Texas State University. The study is part of her Master's thesis research, and is under the supervision of her advisor, Dr. Denise Blanchard-Boehm. We greatly appreciate your participation, and hope you will be able to be interviewed for this study. Your help and that of others being asked to participate in this study is essential to the study's success.

If you have any questions, please do not hesitate to ask the interviewer at the time of the call. You may also contact us at (512) 245-7931 or by mail.

Again, thank you so much for your help.

Sincerely,

Dr. Denise Blanchard-Boehm, Ph.D.  
Associate Professor

Cathryn Anderson, Candidate  
Masters of Science Degree

\*\* If you need a Spanish version of this letter, please call (512) 245-7931.  
Si necesita esta carta en espanol por favor llama a (512) 245-7931.

## Appendix B

### Questionnaire

## APPENDIX B QUESTIONNAIRE

Telephone Interview - Risk Communication in San Marcos  
Cathryn Anderson, Graduate Student  
Southwest Texas State University, Department of Geography

Interviewer:  
Participant name:  
Phone number:

Date:  
ID #:

Day of Week:                      Time begin:

### [INTERVIEW]

Before I begin, I'd like you to know that you may withdraw from the interview at any time, and that you are free to omit answers to any question for any reason. Also, I want to emphasize that your answers are completely confidential. I'll be happy to answer any questions that you might have either now or at any time during the interview. Just stop me at any time and ask. And remember, there is no right or wrong answer for any of these questions.

[For those of you working with the Hispanic population ask this questions]

Would you like to do the survey in Spanish or in English?

SPANISH

ENGLISH

[circle language that applies]

Q1      Have you experienced severe weather, like thunderstorms or tornadoes, or flash flooding while living in San Marcos?

YES      [go to Q4]

NO      [go to next question]

Q2      What locations *have* you experienced severe weather, flooding or other disaster situations? [let them talk] \_\_\_\_\_

[go to next question]

Q3      What types of hazards, such as tornadoes, were you exposed to there? \_\_\_\_\_  
[if the situations do NOT include severe weather and/or flooding, then in the following questions change the hazard to the one they have experienced ... for example, if they have only experienced earthquakes then substitute the word "earthquake" whenever you see severe weather and flooding.]

I'd like to know about the ways you hear of severe weather and flooding.

Q4      This first question asks about how often you use various sources for hearing warnings. On a scale of 1 to 4, with 1 being never, 2 - occasionally, 3- frequently, and 4 - all the time, how often do you receive warning information from TELEVISION [see chart below] [interviewer: reread scale if necessary]

Source	NEVER			ALL THE TIME	
Television	1	2	3	4	
How about from Radio	1	2	3	4	
And from Family and Friends	1	2	3	4	

And from the  
Computer                      1            2            3            4

And how about from  
Your own observations    1            2            3            4

I would like to know a little bit more about these sources. Let me ask you ...

When receiving warning information ...

Q5      Do you watch television stations from Austin, San Antonio, both or neither?

AUSTIN            SA            BOTH            NEITHER            NOT APPLICABLE

Q6      Do you ever watch the weather channel for warnings?            YES      NO

Q7      Do you listen to radio stations out of Austin, San Antonio, both or neither?

AUSTIN            SA            BOTH            NEITHER            NOT APPLICABLE

Q8      Do you have a special radio just for times of severe weather or flooding?  
(For example a NOAA weather radio.)            YES            NO

Q9      In this next question, I would like to know about your opinion of how effective these warning sources are. On a scale of 1 to 4, 4 being very effective and 1 being very *ineffective*, how effective do you think it is to learn about flood and severe weather conditions from TELEVISION? [go to chart below]

[if the interviewee needs more explanation on the scale you may tell them: 1 is very ineffective, 2 - somewhat ineffective, 3- somewhat effective, and 4 very effective.]

Source	VERY INEFFECTIVE				VERY EFFECTIVE	DON'T KNOW
Television	1	2	3	4		DK
How about from Radio	1	2	3	4		DK
And from Family and Friends	1	2	3	4		DK
How about from the computer	1	2	3	4		DK
And from Your own observations	1	2	3	4		DK

Q10      Think about all the warnings that you've received during times of severe weather and flooding, do you feel that the warning messages from various sources are consistent with each other, or do you feel that these warning messages conflict with each other?

CONFLICTING            CONSISTENT            NO OPINION

If answer "CONFLICTING" [probe with following questions] ...

Which sources conflict with each other?

How does the information differ among the sources?

Q11 I am going to read a list of ways people learn of an immediate danger. I would like to know which way you would *prefer* to hear a warning. From this list, pick three ways that you would prefer the most to hear a severe weather or flood warning. If you need the list repeated, I will be happy to read it through for you again. [Interviewer: Read the list slowly!]

- ☐ Police coming to the door
- ☐ Family member
- ☐ Neighbors
- ☐ Siren in the community
- ☐ Special weather radio
- ☐ Local radio
- ☐ Local television
- ☐ Phone ringing automatically with a warning message

Q12 How often do you seek condition updates during a severe weather or flood event; would you say always, frequently, occasionally, or never?

ALWAYS      FREQUENTLY      OCCASIONALLY      NEVER

Q13 How often do you notify friends and family of severe weather and flood conditions; would you say always, frequently, occasionally, or never?

ALWAYS      FREQUENTLY      OCCASIONALLY      NEVER

Q14 I am going to read to you a list of sources for severe weather and flood information. I would like for you to consider which sources you feel are **TRUSTWORTHY**. If you need any of the information repeated, please let me know.

Indicate which of the following you think is a trustworthy source by saying YES for a **trustworthy** source and NO for **not a trustworthy** source after each name.

[Interviewer: Place a check in front of the sources to which the respondent says YES]

- ☐ National Weather Service
- ☐ Emergency Personnel - like the fire or police
- ☐ American Red Cross (like pamphlets or announcements)
- ☐ Government Officials - like the mayor, governor or judge
- ☐ Friends/Family
- ☐ Neighbors
- ☐ Radio
- ☐ Meteorologists
- ☐ Television
- ☐ Newspaper

Q15 Do you read pamphlets or newspaper inserts about disaster preparedness?

YES      NO

Q16 I have a list here of activities people do after a flood or severe weather warning; if you will, tell me which of these you have done upon hearing a flood or severe weather warning. Indicate which ones you do by saying YES after I read the action and which ones you do not do by saying NO after I read the action.

- ☐ Listen to the radio
- ☐ Take cover (such as get indoors)
- ☐ Stay awake until danger is gone if it is at night or bedtime
- ☐ Call others about the danger
- ☐ Locate family and/or friends
- ☐ Continue to call family and friends during the event
- ☐ Keep updated with the media during the event
- ☐ Protect home and/or property
- ☐ Stockpile food and water
- ☐ Move to safer location

Q17 Have you ever evacuated because of a dangerous situation from weather or flooding?

YES [ask next two questions]

NO [go to next question]

When you evacuated your home, did you decide to do this on your own or did an official ask you to leave?

SELF

OFFICIAL

Where did you go when you evacuated? \_\_\_\_\_

[If say "SHELTER," please ask...] What is the name of that shelter?

\_\_\_\_\_

I would like to know a couple things about your experiences in San Marcos ...

Q18 While living in San Marcos, has any of your property been damaged by flooding or severe weather? YES NO

If YES ... I'm going to read a list of ranges for you, which level of damage would you say was done to your property? Would you say:

LESS THAN \$1,000

BETWEEN \$1,000 and \$5,000 or

MORE THAN \$5,000

Q19 While living in San Marcos, has yours or your family's safety ever been threatened by flooding or severe weather? YES NO

Q20 Were you in San Marcos during the flood on October 18<sup>th</sup>, 1998? YES NO

In our remaining time, I would like to know about your opinion on future weather and flooding events in San Marcos.

Q21 In this next question, I would like for you to think about the likeliness of future disasters in San Marcos. I will read a statement about a disaster. After I read the statement, please rate the likeliness of the event on a scale of 1 to 4, with 4 being the most likely.

Event	VERY UNLIKELY			VERY LIKELY
Any disaster happening in San Marcos in the next 10 years.	1	2	3	4
An October 1998-type flood occurring in the next ten years	1	2	3	4
Your home/apartment being seriously damaged by severe weather or flooding in the next ten years.	1	2	3	4
Yours or your family's safety being threatened by severe weather or flooding in the next ten years.	1	2	3	4

Q22 I'm going to read some statements that people have made about flooding in San Marcos. Please, tell me if you agree or disagree.

	DISAGREE	AGREE	NO OPINION
Now that this area has experienced a flood, no more floods will happen for a while.	1	2	3
There is nothing I can do about floods so there is no reason to prepare for one.	1	2	3
Any preparations I make for floods will play an important part in saving my life or property during a flood in the FUTURE	1	2	3
Preparations I made in the PAST played an important part in saving my life or property during a flood.	1	2	3
Chance or luck will play an important part in saving my life or property during a flood.	1	2	3

Q23 How damaging do you think the next flood will be relative to the October 1998 Central Texas flood? Do you think that the next one will be much more damaging, a little more damaging, a little less damaging, or much less damaging?

MUCH MORE    LITTLE MORE    LITTLE LESS    MUCH LESS    DON'T KNOW



Q24 How prepared do you think your HOUSEHOLD is for a flood? Would you say very prepared, somewhat prepared, somewhat unprepared, or not prepared at all?

VERY PREPARED SOMEWHAT PREPARED SOMEWHAT UNPREPARED NOT AT ALL

Q25 How prepared do you think your COMMUNITY is for a flood? Would you say very prepared, somewhat prepared, somewhat unprepared, or not prepared at all?

VERY PREPARED SOMEWHAT PREPARED SOMEWHAT UNPREPARED NOT AT ALL

We're finally at the end of the survey, and I have just a couple items that we need to know about our participants. First of all,

Q26 How long have you lived in San Marcos? \_\_\_\_\_

Q27 How long have you lived at your current location? \_\_\_\_\_

Q28 Do you live in the 100-year floodplain? YES NO DON'T KNOW

Q29 Do you live in the 500 year floodplain? YES NO DON'T KNOW

Q30 How far from a river would you say live? \_\_\_\_\_  
(This could be the San Marcos or Blanco River)

Q31 a. What major ethnic group do you consider your household to be from?

\_\_\_\_\_ Anglo  
\_\_\_\_\_ African-American  
\_\_\_\_\_ Hispanic [\*\*see part b]  
\_\_\_\_\_ Other

b. If HISPANIC ... Can you tell me which one of these is your background? [read the list]

\_\_\_\_\_ Cuban  
\_\_\_\_\_ Puerto Rican  
\_\_\_\_\_ Mexican  
\_\_\_\_\_ Other

If OTHER ... what is your background then? \_\_\_\_\_

Q32 I'm going to read a list of age categories. If you will, tell me which category you belong to.

Under 19	20-24	25-29	30-39
40-49	50-59	60-69	70 and over

Q33 What would you say your highest level of education is? (highest degree completed)

_____ HIGH SCHOOL	_____ GRADUATE SCHOOL
_____ 2-YEAR COLLEGE	_____ POST-GRADUATE WORK
_____ 4-YEAR COLLEGE/UNIVERSITY	OTHER _____

Q34 Would you be willing to participate in any future research studies about emergency warnings in San Marcos? YES NO

[Note if the interviewee is male or female. M F]

I want to thank you for your time; we greatly appreciate your willingness to share this information with us. The answers you gave us will help make the study a success.

[Time interview ended \_\_\_\_\_]

THE END ☺ You're done with this interview! Please fill in the log form and call list at this time.

**Appendix C**  
**Interviewer Packet**

APPENDIX C  
INTERVIEWER PACKET



Cathy Anderson  
Department of Geography  
601 University Drive  
San Marcos, TX

October 6, 2000

Dear «interviewer»,

I want to first thank you for your willingness to help in this research. The results could, and hopefully will, have profound implications upon warning systems in San Marcos. Please review the information in this packet and make sure you have all the materials. These materials are to help you prepare for conducting the telephone survey. I would appreciate any comments and suggestions you may have about any of the materials. The rest of this letter gives you pertinent information for conducting the survey.

You should have the following information in this packet:

- Cover Letter
- Research Abstract
- Interviewing Instructions
- Sample Call Log
- Interviewer Script
- Sample Questionnaire
- Responses to Refusals
- What Respondents Might Want to Know

The “Research Abstract” provides background information for you that may be helpful in communicating survey purposes to others. The “Interviewer Instructions” gives procedure details for the whole interview and for the other forms. The “Sample Call Log”, “Interviewer Script”, and “Sample Questionnaire” are for when you do the actual interviewing. Please, read through these materials to make sure everything makes sense. We are in the final stages of questionnaire testing, so please feel free to make suggestions about the questionnaire, log sheet, or script. I want you to be able to understand

everything and for the interviews to go as smoothly as possible. You will receive a list of names and phone numbers, call log sheets, and questionnaires for the interviews in about two weeks. You will need to keep “The Responses to Refusals” and “What Respondents Might Want to Know” forms close to you during interviews so you may respond to questions appropriately.

It is very important that you practice the interview several times. You may practice with friends or family. I am also very happy to go through it several times with you. I could certainly use more practice myself.

If you have any questions or run into any problems, please contact me as soon as possible. Here is a list of phone numbers you may reach me at or leave messages. I appreciate your help!

Grad Pit: 245-7931(morning and early afternoon)

Future Home: 555-1234 (Scott’s,late afternoon and evening)

Home: 555-5678 (night and early morning)

McCarty Student Center: 555-1011 (If you don’t know where to call and want to just leave a message, I stop by here every morning and afternoon. Betty, the secretary, is there in the mornings and could tell you where I may be.)

E-mail: ca55555@swt.edu(I check this every day)

Sincerely,

Cathy Anderson

## RESEARCH ABSTRACT

Risk Communication and Ethnicity: Anglo and Hispanic Responses  
To Disaster Warnings in San Marcos, Texas

The purpose of this study is to investigate the degree to which ethnicity plays a role in whether individuals “hear” warning messages of their increased vulnerability to a future hazardous event. Further, this study will demonstrate the extent to which ethnicity affects the level of their “response,” that is, whether or not individuals engage in protective actions to save their lives and properties. A secondary objective of this study is to determine what, if any, other variables interact with ethnicity and its placement within the general risk communication model.

In October of 2000, data will be collected through a telephone survey in San Marcos, Texas. Approximately 300 individuals will be contacted, 150 Anglo and 150 Hispanic. Descriptive and statistical analysis of results include t-tests and logistical regression.

Researchers expect ethnicity to affect the level of risk perception, definition of a credible source, individual and social communication networks, and level of response.

Keyword: Risk Communication, Ethnicity, Warnings, Emergency Response

## INTERVIEWING INSTRUCTIONS

### A. Before you start, be sure...

1. To post the "Interviewing Instructions," and "What the Respondent Might Like to Know," in front of you.
2. To look through the names on the stack of questionnaires; if you know anyone or have ever heard of them, notify Cathy and return the questionnaire to her.
3. You have three sharpened pencils with erasers.

B. Avoid going through enumeration process with person who is not a member of the household (i.e. babysitter) or young children. Ask when the selected member will return and tell them you will call back. Also, see the "Interviewer Script" for more detailed information.

C. Make sure you are keeping track of respondents contact information on the "Call Log." Indicate whether the interview was completed, a message was left, or the respondent declined the interview. Record times that respondents are to be called back. If the respondent declines the interview, please indicate so on the questionnaire labeled with their name and ID number.

### D. The interview: Be sure ...

1. To mark the time the interview starts and ends.
2. To record and keep track of respondents on the "Call Log."
3. The respondent understands the questions.

It is very easy for respondents to miss a word or two, that is crucial to the meaning of the question. Sometimes they are embarrassed to admit that they didn't quite understand. If you suspect a question has been misunderstood do not tell the respondent that you think he/she misunderstood; these responses may help.

Could I read the question and the answer I've written down just to be sure I have everything you wanted to say.

I think I may not have read the question correctly, so, may I read it again to be sure.

4. Use neutral probes as needed.

When you are in doubt about how to interpret the respondent's answer or what it means, the coder will be in even greater doubt. Probe, until you are sure. But, do it neutrally. A statement like, "Then what you really mean is ..." does

not convey neutrality. Before accepting an answer of “I don’t know,” be sure to probe. Respondents frequently use that phrase in a way that says, “I’m thinking!”

Some examples of probes you might use:

Yes, I see, (or) Uh-huh, stated in an expectant manner and followed by a pause.

Could you be a little more specific?

I’m not sure I am entirely clear about what you mean. Could you explain it a little more?

Could I read back what I have written down to be sure I have exactly what you wanted to say?

5. To write down everything.

If a respondent qualifies an answer, or if comment (probe) you offer stimulates a new response, write it down. Attempt to get it in verbatim form. Remember if your handwriting is poor you may need to rewrite answers after interviews.

6. To thank the participant!

E. When you hang up:

1. Immediately record time and length of interview.

2. Immediately go over every single answer to make sure it was done correctly. Rewrite answers to open-ended questions that you suspect might be illegible.



## CALL LOG

Interviewer name: \_\_\_\_\_

[Label with respondent information]

\_\_\_\_ Interview Declined by Respondent

                     Interview Completed

\_\_\_\_\_ Willing to participate in future research

Use the following abbreviations and table to keep track of respondent status until the interview is either completed/partially completed or declined.

**Abbreviations:**

NA = No Answer

NH = Not Home

WN = Wrong Number

DN = Disconnected Number

LM = Left Message on answering machine

PC = Partially Completed interview

[illegible]

## INTERVIEWER SCRIPT

Below is the script you need to begin the telephone interview. For those of you who may be nervous, just pretend you're talking to a good friend and smile ☺ Pretty much everyone in San Marcos has a story to tell about flooding, so go ahead and let them talk. Please, take additional notes in the white spaces or on a separate sheet of paper, just as long as the notes get with the appropriate survey and the handwriting is legible. Thanks for your help ... I hope you enjoy hearing the stories.

### Interviewer Tips:

- Practice, Practice, Practice – call a friend and go through the interview several times so you are familiar with the questions
- Make the interview personal
- Make small talk
- Be friendly
- Stress the importance of their information (experiences, opinions) to us
- Don't rush them or seem pushy (you can let them talk but make sure you follow the interview and get the questions answered)

Now, you are ready to dial the number and follow the script! The script provides what to say for answering machines, respondent not home, and respondent answers phone. Please read through and practice it several times before you begin calling respondents.

**Answering Machine Picks Up ...** This is \_\_[your name]\_\_ from Southwest Texas State University. We are calling for the flood warning research that you received a letter about this last week. Your participation in this survey is very important to the success of the research; we will return the call later this week. Thank you and we hope to talk with you soon.

Date/Time of Message(s) \_\_\_\_\_

**Someone Answers the phone ...**

Hello. Is this \_\_[participant]\_\_?

If NO ... May I speak to \_\_\_\_\_?

If NOT AVAILABLE ... I'm calling because we sent a letter asking \_\_[participant]\_\_ if he/she would participate in a survey on how people respond to flood and severe weather warnings in San Marcos. The letter mentions that we would be calling him/her in the near future to get his/her opinions. I'm sorry to have missed \_\_[participant]\_\_. When would be a convenient time to call back?

(Call back on \_\_\_\_\_ around \_\_\_\_\_ am/pm)

If YES ... Good. I am \_\_[your name]\_\_. I'm a graduate student from the Geography Department at Southwest Texas State University. I'm hoping that you received the letter that I sent telling you that I'd be calling to interview you for this survey. It will take about 10 minutes and is strictly on a voluntary basis. Would you be willing to participate in this survey?

YES [go to next question]

NO ... Thank you for your time and have a good evening. Good-bye.

Is this a convenient time for me to talk with you, or should I call back at another time?

If YES ... [go to interview section]

If NO ... When would be a more convenient time for me to call back and talk with

you? (Day \_\_\_\_\_ Time \_\_\_\_\_ am/pm)

## POSSIBLE RESPONSES TO REFUSALS

You will most likely find people who have reasons for not participating in the survey. If you can, try find a time that is better for them that you may return the call. Their opinions and responses to questions are very important not only to the research problem but also for emergency planning in San Marcos. Below are some ways you may try respond to the reasons for not participating; however, please do not force the respondents into the survey. With the responses to refusals, it is merely an attempt to persuade them that their input is extremely important to us. Thank-you!

### REASONS FOR REFUSING

### . . . AND POSSIBLE RESPONSES

#### TOO BUSY

This should only take a few minutes. Sorry to have caught you at a bad time, I would be happy to call back. When would be a good time for me to call in the next day or two?

#### BAD HEALTH

I'm sorry to hear that. Have you been sick long? I would be happy to call back in a day or two. Would that be okay?

(IF LENGTHY OR SERIOUS ILLNESS, substitute another member of household. IF THAT ISN'T POSSIBLE, excuse yourself and indicate they will not be called again.)

#### TOO OLD

Older people's opinions are just as important in this particular survey as anyone else's. In order for the results to be representative for all residents of the state, we have to be sure that older people have as much chance to give their opinion as anyone else does. We really do want your opinion.

#### FEEL INADEQUATE: DON'T KNOW ENOUGH TO ANSWER

The questions are not at all difficult. They mostly concern how you feel about your community rather than how much you know about certain things. Some of the people we have already interviewed had the same concern you have, but once we got started they didn't have any difficulty answering the questions. Maybe I could read just a few questions to you and you can see what they are like.

#### NOT INTERESTED

Its awfully important that we get the opinions of everyone in the sample otherwise the results won't be very useful. So, I'd really like to talk with you.

#### NO ONE ELSE'S BUSINESS WHAT I THINK

I can certainly understand, that's why all of our interviews are confidential. Protecting people's privacy is one of our major concerns and to do it people's names are separated from the answers just as soon as the interview is over. And, all the results are released in a way that no single individual can ever be identified.

#### OBJECTS TO SURVEYS

We think this particular survey is very important because the questions are ones that people in government want to know answers to, so would really like to have your opinion too.

#### OBJECTS TO TELEPHONE SURVEYS

We have just recently started doing our surveys by telephone, because this way is so much faster and it costs a lot less, especially when there aren't very many questions like in this survey.

## WHAT RESPONDENTS MIGHT LIKE TO KNOW About this study

### ABOUT THE SURVEY

#### *WHO IS SPONSORING (PAYING FOR) THE SURVEY?*

It is sponsored through the SWT Department of Geography. It is being paid for jointly from individual research funds and from the Geography Department. The Hispanic Chamber of Commerce has also contributed some work in the research.

#### *WHAT IS THE PURPOSE OF THIS SURVEY?*

We are trying to find out how the residents of San Marcos learn about severe weather and flood conditions in order to determine the best way to warn the public of dangerous situations.

#### *WHO IS THE PERSON RESPONSIBLE FOR THE SURVEY? MAY I TALK TO HER?*

Cathy Anderson is the graduate student doing the survey for her Masters thesis. Her advisor, who is overseeing the study, is Dr. Blanchard-Boehm from the SWT Department of Geography. I am sure either of them would be happy to talk with you. You can contact either one of them through telephone or e-mail. Here is the information you need to talk with them:

Cathy Anderson	245-7931	<a href="mailto:ca21549@swt.edu">ca21549@swt.edu</a>
Dr. Blanchard-Boehm	245-3090	<a href="mailto:rb06@swt.edu">rb06@swt.edu</a>

### ABOUT THE RESPONDENTS ROLE IN THE SURVEY

#### *HOW DID YOU GET MY NAME (TELEPHONE NUMBER)?*

Everyone's name and number was randomly selected from the San Marcos Telephone Directory. In this method, every telephone number has an equal chance of being drawn, and it is strictly by chance that yours is one of them.

#### *HOW CAN I BE SURE THIS IS AUTHENTIC?*

You are welcome to call the Geography Department or my supervisor conducting the study. (See above for Cathy and Dr. Blanchard-Boehm's phone and e-mail). The Geography Department phone number is 245-2170 ... ask for Jena.

#### *WHY DO YOU NEED TO KNOW ABOUT MY ETHNICITY AND AGE?*

Other studies similar to this one have suggested that people of different backgrounds and ages hear warnings from different sources. Because of the diverse population in San Marcos, we want to know how these various groups would like to receive warnings so we may reach all of them.

*WHY DON'T YOU INTERVIEW MY (HUSBAND/WIFE/SON/DAUGHTER, ETC.)?*

We can't do that because it's one of the things that keeps our survey as representing the San Marcos population. If we didn't follow this selection procedure all of the time, we would probably end up with too many men, or on the other hand too many women, of certain ages.

*IS THIS CONFIDENTIAL?*

Yes, most definitely! After the interview is completed the answers are put into the computer without names. All information we release is in a certain percent "yes" and a certain percent "no." In this form no individual response can ever be identified.

*CAN I GET A COPY OF THE RESULTS?*

Yes, we would be glad to send it to you, if you will give me the address you would like us to mail them to. We hope to have the results ready in two months.

## Appendix D

### Variable Definitions

## APPENDIX D VARAIBLE DEFINITIONS

### Variables of Receivers' Characteristics

Variable Name	Definition of Variable	Variable Description
ETHNIC	Ethnicity of respondent	Anglo, African-American, Hispanic, or other
AGE	Age of respondent	under 19, 20-24, 25-29, 30-39, 40-49, 50-59, 60-69, or 70 and over
GENDER	Gender of respondent	Male or female
EDUC	Respondent level of education	High school, 2-year college, 4-year college/university, graduate school, post-graduate work, or other
LENGTHSM	Length of residency in San Marcos, Texas	Respondents give number of years they have lived in San Marcos, Texas
LENGTHLO	Length of residency at current location	Respondents give number of years they have lived at their current location
DISRIVER	Distance respondent lives from the San Marcos or Blanco River	Respondents give the number of miles they live away from the river
FLPL100	Whether or not respondents live in the 100-year floodplain	Yes, no, or uncertain
FLPL500	Whether or not respondents live in the 500-year floodplain	Yes, no, or uncertain
SMDAMAGE	Whether or not respondents Have had property damage by flooding or sever weather	Yes or no If "yes" ... level of property damage: Less than \$1,000, between \$1,000 and \$5,000 or more than \$5,000



SMSAFETY      Whether or not respondents' safety has been threatened by flooding or severe weather      Yes or no

FLOOD98      Whether or not respondents' were in San Marcos during the October 1998 floods      Yes or no

### **Variables of Message Characteristics**

Variable Name	Definition of Variable	Variable Description
FRETV	Frequency that respondents watch television for warning messages	Never, occasionally, frequently or all the time
FRERADIO	Frequency that respondents listen to radio for warning messages	Never, occasionally, frequently or all the time
FREFAFR	Frequency that respondents consult family or friends for warning messages	Never, occasionally, frequently or all the time
FRECOM	Frequency that respondents receive warning messages from the computer	Never, occasionally, frequently or all the time
FREOBS	Frequency that respondents use own observations for warning messages	Never, occasionally, frequently or all the time
TVSTATIO	Location of television stations that respondents watch for warning messages	Austin, San Antonio, both, neither or not applicable
WC	Whether respondents watch the Weather Channel for warning information or not	Yes or no
RADIOSTA	Location of radio stations that respondents listen to for warning messages	Austin, San Antonio, both, neither or not applicable

WR	Whether respondents listen to a special weather radio for warning messages or not	Yes or no
EFFTV	Respondents' opinions of the effectiveness of using television for warning messages	Very effective, somewhat effective, somewhat ineffective, very ineffective
EFFRADIO	Respondents' opinions of the effectiveness of using radio for warning messages	Very effective, somewhat effective, somewhat ineffective, very ineffective
EFFFAFR	Respondents' opinions of the effectiveness of using family or friends for warning messages	Very effective, somewhat effective, somewhat ineffective, very ineffective
EFFCOM	Respondents' opinions of the effectiveness of using computers for warning messages	Very effective, somewhat effective, somewhat ineffective, very ineffective
EFFOBS	Respondents' opinions of the effectiveness of using observations for warning messages	Very effective, somewhat effective, somewhat ineffective, very ineffective
PREFER	Method of notification respondents prefer for receiving a warning message; Respondents choose one of the eight methods	Police coming to the door, family member, neighbors, siren in the community, special weather radio, local radio, local television, phone ringing automatically with a warning message
TRNWS	Whether or not respondents trust the National Weather Service for warning Messages	Yes or no
TREME	Whether or not respondents trust emergency personnel for warning messages	Yes or no

TRRED	Whether or not respondents trust the American Red Cross for warning messages	Yes or no
TRGOV	Whether or not respondents trust government officials for warning messages	Yes or no
TRFR	Whether or not respondents trust friends/family for warning messages	Yes or no
TRNEI	Whether or not respondents trust neighbors for warning messages	Yes or no
TRRAD	Whether or not respondents trust radio stations for warning messages	Yes or no
TRMET	Whether or not respondents trust meteorologists for warning messages	Yes or no
TRTV	Whether or not respondents trust television stations for warning messages	Yes or no

#### **Variables of Receivers' Response and Preparatory Actions**

Variable Name	Definition of Variable	Variable Description
LIST	Whether or not respondents have listened to the radio after hearing a warning message	Yes or no
COVER	Whether or not respondents have taken cover after hearing a warning message	Yes or no

AWAKE	Whether or not respondents have stayed awake until danger was gone after hearing a warning message	Yes or no
CALL	Whether or not respondents have called others about the danger after hearing a warning message	Yes or no
LOC	Whether or not respondents have located family after hearing a warning message	Yes or no
CTCAL	Whether or not respondents continued to call others during a severe weather or flood event	Yes or no
UPDA	Whether or not respondents have kept updated with the media after hearing a warning message	Yes or no
PROT	Whether or not respondents have protected their home after hearing a warning message	Yes or no
STOCK	Whether or not respondents have stockpiled food and water after hearing a warning message	Yes or no
MOVE	Whether or not respondents Have moved to a safer location after hearing a warning message	Yes or no

EVACUATE	Whether or not respondents have evacuated in the past	Yes or no If “yes” then respondent says whether they evacuated themselves or by an official
READINFO	Whether or not respondents read pamphlets or newspaper inserts about disaster preparedness	Yes or no

### **Variables of Receivers’ Perceptions of Risk**

Variable Name	Definition of Variable	Variable Description
LIKDIS	Likelihood of any disaster occurring in San Marcos in the next ten years	Very likely, somewhat likely, somewhat unlikely, or very unlikely
LIKE98FL	Likelihood of an October 1998-type flood occurring in San Marcos in the next ten years	Very likely, somewhat likely, somewhat unlikely, or very unlikely
LIKEDAMA	Likelihood of respondents’ home being damaged by severe weather or flooding in the next ten years	Very likely, somewhat likely, somewhat unlikely, or very unlikely
LIKESAFE	Likelihood of respondents’ safety being threatened by severe weather or flooding in the next ten years	Very likely, somewhat likely, somewhat unlikely, or very unlikely
DANOMORE	“Now that this area has Experienced a flood, no more floods will happen for a while”	Agree, disagree, or no opinion
DANOPREP	“There is nothing I can do about floods so there is no reason to prepare for one.”	Agree, disagree, or no opinion

DAPREFUT	“Any preparations I make for floods will play an important part in saving my life or property during a flood in the FUTURE.”	Agree, disagree, or no opinion
DAPREPAS	“Preparations I made in the PAST played in important part in saving my life or property during a flood.”	Agree, disagree, or no opinion
DACHANCE	“Chance or luck will play an important part in saving my life or property during a flood.”	Agree, disagree, or no opinion
PREPHOUS	Respondents’ opinions of how prepared their household is for a flood	Very prepared, somewhat prepared, somewhat unprepared, very unprepared
PREPCOMM	Respondents’ opinion of how prepared the community is for a flood	Very prepared, somewhat prepared, somewhat unprepared, very unprepared

## REFERENCE LIST

- Blanchard-Boehm, Denise R. 1998. Understanding public response to increased risk from natural hazards: Application of the hazards risk communication framework. *International Journal of Mass Emergencies and Disasters* 16, no. 3: 247 - 278.
- Blanchard, Denise R. 1992. Risk communication and individual response: Impact of the 1990 revised earthquake probabilities for the San Francisco Bay Area. Ph.D. diss., University of Colorado.
- Burkett, April. 1999. A century of floods on the San Marcos River. *Hill country flood of 1998: A comprehensive study of the impact on San Marcos*. Blanchard-Boehm, R.D. (ed.). Department of Geography, Southwest Texas State University. Unpublished report.
- CenturyTel of San Marcos. 1999. *November 1999 San Marcos Telephone Directory*.
- City of San Marcos. 1997. *San Marcos Emergency Management Plan*.
- Connelly, Nancy A., and Barbara A. Knuth. 1998. Evaluating risk communication: Examining target audience perceptions about four presentation formats for fish consumption health advisory information. *Risk Analysis* 18, no. 5: 649-659.
- Dillman, Don A. 1978. *Mail and telephone surveys: The total design method*. New York: John Wiley & Sons, Inc.
- Drabek, Thomas E. 1986. *Human systems responses to disaster: An inventory of sociological findings*. London: Springer-Verlag, 1986.
- Drabek, Thomas E. 1996. *The social dimensions of disaster: A FEMA higher education course*. Emergency Management Institute, Emmitsburg,, MD: Federal Emergency Management Agency.
- Estaville, Lawrence E., Susan W. Hardwick, James P. Allen, and Ines M. Miyares. 1999. American ethnic geography: Development, contributions, and challenges. for *Geography in America at the dawn of the 21<sup>st</sup> century*.
- Farley, J.E., H.D. Barlow, M.S. Finkelstein, L. Riley, and L.G. Bender. 1991. Earthquake hysteria, before and after: A survey and follow-up on public response to the Browning Forecast. Paper presented at the Research Conference on Public and Media Response to Earthquake Forecasts, May 16-18, Southern Illinois University, Edwardsville.

- Fishman, Joshua A. 1999. *Ethnicity and language*. New York: Oxford University Press,
- Fothergill, Alice, Enrique Maestas, JoAnne DeRouen Darlington. 1999. Race, ethnicity and disasters in the United States: A review of the literature. *Disasters* 23, no.2: 156-173.
- Gutteling, Jan M. and Oene Wiegman. 1996. *Exploring risk communication*. Netherlands: Kluwer Academic Publishers.
- Handmer, John and Edmund Penning-Rowsell. 1990. *Hazards and the communication of risk*. Great Britain: Gower Technical.
- Henerson, Marlene E., Lynn Lyons Morris, and Carol Taylor Fitz-Gibbon. 1982. *How to measure attitudes*. Newbury Park: Sage Publications.
- Horel, Scott. 1999. Flood risk in San Marcos. *Hill country flood of 1998: A comprehensive study of the impact on San Marcos*. Blanchard-Boehm, R.D. (ed.). Department of Geography, Southwest Texas State University. Unpublished report.
- Ives, Sallie M. and Owen J. Furuseth. 1983. Immediate response to headwater flooding in Charlotte, North Carolina. *Environment and Behavior* 15, no. 4: 512-525.
- Kasperson, Roger E., Ortwin Renn, Paul Slovic, Halina S. Brown, Jacque Emel, Robert Goble, Jeanne X. Kasperson, and Samuel Ratick. 1988. The social amplification of risk: A conceptual framework. *Risk Analysis* 8, no. 2: 177-187.
- Lundgren, Regina E. 1994. *Risk communication: A handbook for communicating environmental, safety, and health risks*. Ohio: Batelle Press.
- Mangione, Thomas W. 1995. *Mail surveys: Improving the quality*. Thousand Oaks, CA: Sage Publications.
- Marin, Gerardo and VanOss Marin. *Research with Hispanic populations*. Applied Social Research Methods Series. Newbury Park: Sage Publications, 1991.
- Mileti, Dennis S. 1999. *Disasters by design: A reassessment of natural hazards in the United States*. Washington D.C.: National Academy of Science.
- Mileti, Dennis S., Colleen Fitzpatrick, and Barbara C. Farhar. 1990. *Risk communication and public response to the Parkfield Earthquake Prediction Experiment: Final report to the National Science Foundation*. Fort Collins, CO: Hazards Assessment Laboratory and Department of Sociology, University of Colorado.
- Millecam, Melissa, Public Information Officer of San Marcos. 1999. Informal discussion with author, 15 November. San Marcos, Texas.



Nathe, Sarah, Paula Gori, Marjorie Greene, Elizabeth Lemersal, and Dennis Mileti. 1999. Public education for earthquake hazards. *Natural Hazards Informer* 23, no. 2: 1-11.

*The new analytical Bible and dictionary of the Bible*. 1973. Authorized King James Version. Grand Rapids, Michigan: World Publishing.

O'Conner, Robert E., Richard J. Bord, and Ann Fisher. 1999. Risk perceptions, general environmental beliefs, and willingness to address climate change. *Risk Analysis* 19, no. 3: 461-471.

O'Leary, Dan. 1999. *October 1998 Flood San Marcos, Texas*. San Marcos, TX: City of San Marcos.

O'Leary, Dan, fire chief of San Marcos. 1999. Informal discussion with author, 20 November. San Marcos, Texas.

Peacock, Walter and Chris Girard. 1997. Ethnic and racial inequalities in hurricane damage and insurance settlements. In W.G. Peacock, B.H. Morrow and H. Gladwind, eds. *Hurricane Andrew: Ethnicity, gender and the sociology of disasters*. Routledge, New York.

Perry Castaneda Map Collection. University of Texas: Austin, Texas.

Perry, Ronald W., Majorie R. Green, and Battelle Human Affairs Research Centers. 1982. The role of ethnicity in the Emergency Decision-Making Process. *Sociological Inquiry* 52, no. 4: 306-334.

Perry, Ronald W. and Michael K. Lindell. 1991. The effects of ethnicity on evacuation decision-making. *International Journal of Mass Emergencies* 9, no. 1: 47-68.

Perry, Ronald W., Michael K. Lindell, Majorie R. Green, and Battle Human Affairs Research Centers. 1982. Crisis communications: Ethnic differentials in interpreting and acting on disaster warnings. *Sociol Behavior and Personality* 10, no. 1: 97-104.

Perry, Ronald W. and Alvin H. Mushkatel. 1984. *Disaster management: Warning response and community relocation*. Connecticut: Quorum Books.

Perry, Ronald W. and Lisa Nelson. 1991. Ethnicity and hazard information dissemination. *Environmental Management* 15, no. 4: 581-587.

Phillips, Brenda D. 1993. Cultural diversity in disasters: Sheltering, housing, and long term recovery. *International Journal of Mass Emergencies and Disasters* 11, no. 1: 99-110.

- Platt, Lyman D. 1996. *Hispanic surnames and family history*. Baltimore: Genealogical Publishing Co, Inc.
- Rogers, George O. 1992. Aspects of risk communication in two cultures. *International Journal of Mass Emergencies and Disasters* 10, no. 3: 437-464.
- Salant, Priscilla and Don A. Dillman. 1994. *How to conduct your own survey*. New York: John Wiley & Sons, Inc.
- San Marcos Chamber of Commerce. 2000. Population Estimates for 2000.
- Showalter, Pamela S. 1993. Prognostication of doom: An earthquake prediction's effect on four small communities. *International Journal of Mass Emergencies and Disasters* 11, no. 3: 279-292.
- Sokolowska, Joanna and Tadeusz Tuszka. 1995. Perception and acceptance of technological and environmental risks: Why are poor countries less concerned? *Risk Analysis* 15, no. 6: 733-743.
- Sorenson, John H. and Dennis S. Mileti. 1988. "Risk Communication for Emergencies." Paper prepared for R. Kaspersen and P. Stallen, eds., *Communicating Risks to the Public: International Perspectives*.
- Southwest Texas State University. 1996. *San Marcos: A Guide to a historic Texas town*. San Marcos, TX: Southwest Texas State University, Department of History.
- Strong, James. 1990. *Strong's exhaustive concordance of the Bible: together with dictionaries of the Hebrew and Greek words of the original*. Nashville, Tennessee: Thomas Nelson Publishers.
- Turner, R.H., J.M. Nigg, and D.H. Paz. 1986. *Waiting for disasters earthquake watch in California*. Berkeley and Los Angeles: University of California Press.
- United States Census Bureau. 1990. Tape 3A data files.
- United States Census Bureau. 1999. Population Estimates.  
<http://www.census.gov/population/estimates>.
- United States Department of Agriculture. 1984. *Soil Survey of Comal and Hays Counties Texas*.