Quick Response Report #127

Hurricane Georges: A Multinational Study Examining Preparedness, Resource Loss, and Psychological Distress in the U.S. Virgin Islands, Puerto Rico, Dominican Republic, and the United States

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2000

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This material is based upon work supported by the National Science Foundation under Grant No. CMS-9632458. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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ABSTRACT

This cross-national project examined preparation for and psychological functioning following Hurricane Georges in the U.S. Virgin Islands, Puerto Rico, Dominican Republic, Alabama, and Mississippi. Four to five weeks after the storm made landfall, 697 participants (222 men, 476 women) completed a questionnaire asking about demographic characteristics, preparation, social support, coping, resource loss, and symptoms associated with acute stress disorder. In all locations, resource loss was of substantial importance among the other variables in predicting psychological distress. In addition, storm strength and location accounted for a significant portion of psychological distress variance. The findings support the conservation of resources stress theory (Hobfoll, 1989). Implications of the findings and future research directions are discussed.

INTRODUCTION

Hurricane Georges took an extremely destructive path through the Caribbean, the Florida Keys, and the Gulf Coast of the United States. This cross-national project examined preparation efforts for and psychological functioning following Hurricane Georges in the U.S. Virgin Islands, Puerto Rico, Dominican Republic, Mississippi, and Alabama. Cross-national disaster studies examining preparedness and psychological distress are rare, and "almost no studies exist that have attempted to compare directly responses of one culture or nation to another to determine a potentially different extent or type of reaction to such events . . .[or that examine] the same outcomes in equivalent populations from one country to another" (Green, 1996, p. 341).

On September 21, 1998, Hurricane Georges struck the U.S. Virgin Islands with sustained winds of 90 miles per hour and 113 mile per hour gusts. Property damage estimates were $2 million (National Weather Service, 1999), 1,000 persons were left homeless (Federal Emergency Management Agency, 1999), 20 homes were destroyed, and 50 homes were damaged (National Climactic Data Center, 1999). No one was killed. That same day, Hurricane Georges strengthened and struck Puerto Rico with sustained winds of 102 miles per hour and 165 mile per hour gusts. It made landfall on the southeastern side of the island. Property damage estimates were $2 billion, 31,400 persons were left homeless, 33,113 homes were destroyed, and 27,006 homes were damaged. Ten persons were killed as a direct result of the storm (National Climactic Data Center, 1999).

Hurricane Georges regained strength after passing over Puerto Rico. On September 22, 1998, the storm hit the Dominican Republic with sustained winds of 121 miles per hour. Property damage

estimates were $1.25 billion, 100,000 persons were left homeless (National Climactic Data Center, 1999), and more than 100,000 homes were damaged or destroyed (United Methodist Committee on Relief, 1998). Three hundred persons were killed as a direct result of the storm (National Climactic Data Center, 1999). The storm passed the Florida Keys, and on September 28, 1998, and Hurricane Georges struck the Gulf Coast of the United States with sustained winds of 81 miles per hour and 117 mile per hour gusts. It made landfall near Biloxi, Mississippi. Property damage estimates were $1.2 billion, about 300 persons were left homeless, 150 homes were destroyed, and 1,500 homes were damaged (National Climactic Data Center, 1999). Five people were killed as a direct result of the storm.

This study assessed symptoms associated with acute stress disorder - a psychological reaction that may develop within the first four weeks following a life threatening event in which the person responds with intense fear, helplessness, or horror - as the measure of psychological distress. Acute stress disorder is related to posttraumatic stress disorder; it is characterized by intrusive memories of the traumatic event, emotional withdrawal, and heightened autonomic arousal. This disorder does not endure for more than one month following the initial event. Few studies have examined acute stress disorder symptoms in the context of a natural disaster, as it is a new category in the *Diagnostic and Statistic Manual* (DSM-IV; American Psychiatric Association, 1994).

The project was guided by the conservation of resources stress theory, which predicts that psychological stress occurs when there is a *threat* of resource *loss*, loss of resources, or *lack of resource gain* following investment of resources (Hobfoll, 1989). The theory specifies four types of resources: object (e.g., physical possessions such as home, car, furniture); condition (e.g., social roles, marriage, employment); personal characteristic (e.g., age, locus of control, self-esteem, knowledge, skills); and energy (e.g., money, insurance). The theory also predicts that resource gains may have positive effects, such as learning the value of preparation, how to recover in the aftermath of a disaster, and developing an enhanced sense of self-efficacy and coping skills (Calhoun and Tedeschi, 1998; Hobfoll, Dunahoo, and Monnier, 1995).

This project examined two primary research questions based on the conservation of resources stress theory and previous research. First, will resource loss be associated with psychological distress? Second, will resource loss be of substantial importance among several other variables in predicting psychological distress? Because this was an exploratory cross-national study, no predictions concerning location were made.

METHOD

Participants

The participants were 697 persons (222 men, 475 women) in five locations struck by Hurricane Georges. All were attending four-year universities, and they did not receive any inducements. Participants in the *U. S. Virgin Islands* were 103 students (25 men, 78 women) at the University of the Virgin Islands, St. Thomas campus. Participants in *Puerto Rico* were 272 students (66

men, 206 women) enrolled in psychology courses at the University of Puerto Rico, Rio Piedras campus. Participants in *Dominican Republic* were 177 students (93 men, 84 women) at Universidad APEC and Pontificia Universidad Catolica Madre y Maestro, Santo Tomas de Aquno campus. Participants in *Mississippi* were 53 students (13 men, 40 women) at the University of Southern Mississippi-Gulf Coast in Long Beach, Mississippi. Participants in *Alabama* were 92 students (24 men, 68 women) at the University of Southern Alabama in Mobile, Alabama. Table 1 presents the demographic characteristics of each sample.

Materials

A cover letter attached to the anonymous and confidential questionnaire described the purposes of the study. The first section of the questionnaire asked for demographic information, and information about preparation for and monitoring of the storm before it made landfall and property damage due to the storm. Table 2 shows the preparation items. To indicate their answers, for each item the participants checked one of several possible answers that best reflected their experience. The second section included 24 items asking about resource losses (cf. Sattler, 2000). Participants used a 4-point scale (1=no loss to 4=extensive loss) to indicate their answers. The third section included 16 acute stress disorder items developed by the author, and 15 items from the short-form of the Multiscore Depression Inventory (Berndt, 1986). The fourth section assessed coping, perceptions of aid, social support (Kaniasty and Norris, 1993; McCubbin and Thompson, 1991), and culturally specific responses and symptoms (Sattler, Sattler et al., 1995). Participants used a 4-point scale (1=not at all to 4=quite a bit) to indicate their answers for the items in the fourth section. The fifth section asked participants whether they had experienced any of five traumatic events during their lifetime, and if they had experienced one or more of three low-magnitude stressful life events in the year prior to completing the questionnaire. Participants used a 2-point scale (1=no, 2=yes) to indicate their answers for the items in this section.

Procedure

The questionnaires were completed four to five weeks after Hurricane Georges made landfall at each location. Participants completed the questionnaires in their classrooms, which took about 40 minutes. Participants in Puerto Rico and the Dominican Republic completed a version of the questionnaire in Spanish; all other participants completed the questionnaire in English.

RESULTS: SCALE RELIABILITY

The first set of analyses examined the reliability of each scale. To create the measures for acute stress disorder, preparation, social support, resource loss, and depression, we summed the items on each scale. Coefficient alpha indicated that each scale had adequate to good reliability: acute stress disorder symptoms, range across locations: a = .87 - .96, Mdn a = .90; preparation, range across locations: a = .63 - .73, Mdn a = .70; social support, range across locations: a = .76 - .84, Mdn a = .79; resource loss, range across locations: a = .90 - .95, Mdn a = .93.; and depression, range across locations: a = .60 - .75, Mdn a = .69.

Results: Preparation, Property Damage, Distress, and Psychosocial Responses

The next set of analyses examined preparation activities, property damage, distress, and psychosocial responses. The analyses are presented separately for each of the five locations.

U.S. Virgin Islands

Preparation - More than three-quarters of the participants knew that the hurricane was a threat for three or more days in advance (80%), took the hurricane warnings seriously (80%), and indicated that they were well prepared with supplies before the hurricane (81%). Table 2 shows that more than three-quarters of the participants had the following supplies on hand: bottled water, canned or dried food, batteries, candles and matches. Almost half (48%) began preparing for the storm more than 24 hours in advance, but 21% began preparing 16-23 hours before, and 30% began preparing less than 15 hours before the storm. Three-quarters (75%) of the participants had been through another natural disaster.

Property Damage and Physical Injury - Sixty-four percent of the participants did not have damage to their homes, 32% had minor damage, 2% had moderate damage, and 2% had major damage. The average number of days that participants were without utilities was as follows: electric power: 3.50 days; water: 3.69 days; telephone service: 1.73 days. Participants returned to work or school an average of 16 days after the storm hit the island. No participant lost his or her job as a result of the storm. About one-quarter of the participants (22%) had adequate insurance coverage, 7% had some coverage, and 21% did not have insurance to cover their house or possessions. However, half (50%) indicated that they did not know about their insurance coverage. One percent were physically injured during the storm or clean-up, and 2% had a family member or friend who was physically injured during the storm or clean-up.

Distress and Psychosocial Responses - Table 3 shows that less than one-tenth of the participants reported experiencing any psychological distress symptom associated with acute stress disorder. Table 4 presents psychosocial responses related to the impact of the hurricane. More than half of the participants were angry at people who were breaking laws to get aid and supplies and believed that the storm was due to God's will. More than one-third of the participants believed that neighbors had helped each other more than usual, believed that friends and military personnel had been helpful, had made new friends, and had taken on more responsibilities. Less than one-tenth had done things they did not like to get aid and supplies, believed that the lack of aid was their fault, and that they were suffering more than other people.

Puerto Rico

Preparation - Almost two-thirds (62%) of the participants knew that the hurricane was a threat for three or more days in advance. Most participants took the hurricane warnings seriously (84%), and indicated that they were well prepared with supplies before the hurricane (86%). Table 2 shows that more than three-quarters of the participants had the following supplies on hand: bottled water, canned or dried food, batteries, candles and matches. Almost half (47%) began preparing for the storm more than 24 hours in advance, but 26% began preparing 16-23

hours before, and 26% began preparing less than 15 hours before the storm. Almost two-thirds (63%) of the participants had been through another natural disaster.

Property Damage and Physical Injury - Forty-two percent of the participants did not have damage to their homes, 37% had minor damage, 19% had moderate damage, and three percent had major damage. The average number of days participants were without utilities was as follows: electric power: 15.02 days; water: 10.68 days; telephone service: 9.81 days. Participants returned to work or school an average of 25 days after the storm hit the island. No participant lost his or her job as a result of the storm. About one-third (35%) had adequate insurance coverage, 21% had some coverage, and 26% did not have insurance to cover their house or possessions. Nineteen percent did not know about their insurance coverage. Two percent were physically injured during the storm or clean-up, and 6% had a family member or friend who was physically injured during the storm or clean-up.

Distress and Psychological Responses - Table 3 shows that about one-quarter of the participants reported experiencing the following acute stress disorder symptoms: feeling time standing still, anxious, having difficulty doing work or other things, getting upset and/or angry easily, and feeling mixed up or disoriented. Less than one-tenth reported feeling emotionally numb, having difficulty remembering important things about the storm, feeling like someone else, having trouble feeling their emotions, thinking about the hurricane when they did not want to, and having nightmares about the hurricane.

Table 4 presents psychosocial responses related to the impact of the hurricane. More than half of the participants were angry at people who were breaking laws to get aid and supplies; believed that storm was due to God's will; believed that neighbors, friends, police officers, military personnel, social workers, and insurance adjusters were helpful; and had taken on more responsibilities. More than one-third of the participants had made new friends and were busy rebuilding their lives. Less than one-tenth believed that the lack of aid was their fault and that they were suffering more than other people.

Dominican Republic

Preparation - Half (50%) of the participants knew that the hurricane was a threat for three or more days in advance. Most participants took the hurricane warnings seriously (72%), and indicated that they were well prepared with supplies before the hurricane (75%). Table 2 shows that most of the participants had the following supplies on hand: bottled water, canned or dried food, batteries, candles and matches. Almost one-quarter (23%) began preparing for the storm more than 24 hours in advance, 20% began preparing 16-23 hours before, and 48% began preparing less than 15 hours before the storm. About one-quarter (23%) of the participants had been through another natural disaster.

Property Damage and Physical Injury - Forty-five percent of the participants did not have damage to their homes, 29% had minor damage, 19% had moderate damage, and 7% had major damage. The average number of days participants were without utilities was as follows: electric power: 12.76 days; water: 9.45 days; telephone service: 5.00 days. Participants returned to work or school an average of 16 days after the storm hit the island. No participant lost his or her job as

a result of the storm. About one-quarter of the participants (28%) had adequate insurance coverage, 18% had some coverage, and 33% did not have insurance to cover their house or possessions. Twenty percent did not know about their insurance coverage. Six percent were physically injured during the storm or clean-up, and 13% had a family member or friend who was physically injured during the storm or clean-up.

Distress and Psychosocial Responses - Table 3 shows that about one-quarter of the participants reported experiencing the following acute stress disorder symptoms: feeling time standing still and feeling anxious. Less than one-tenth reported being slow to react to people around them, getting upset when events reminded them of the storm, feeling like someone else, having trouble feeling their emotions, thinking about the hurricane when they did not want to, and having nightmares about the hurricane.

Table 4 presents psychosocial responses related to the impact of the hurricane. More than half of the participants were angry at people who were breaking laws to get aid and supplies; believed that the storm was due to God's will; believed that neighbors, friends, police officers, military personnel, and social workers were helpful; had taken on more responsibilities, and had made new friends. More than one-third of the participants believed that insurance adjusters had been helpful, were busy rebuilding their life, and had become more involved in community activities. About one-tenth had done things they did not like to get aid and supplies, believed that the lack of aid was their fault, and were hurting more than other people.

United States: Long Beach, Mississippi

Preparation - Almost two-thirds (64%) of the participants knew that the hurricane was a threat for three or more days in advance. Most participants took the hurricane warnings seriously (87%), and indicated that they were well prepared with supplies before the hurricane (83%). Table 2 shows that more than three-quarters of the participants had the following supplies on hand: bottled water, canned or dried food, batteries, candles and matches. Almost half (49%) began preparing for the storm more than 24 hours in advance, but 25% began preparing 16-23 hours before, and 26% began preparing less than 15 hours before the storm. Almost three-quarters (70%) of the participants had been through another natural disaster.

Property Damage and Physical Injury - Twenty-six percent of the participants did not have damage to their homes, 60% had minor damage, and 13% had moderate damage. The average number of days participants were without utilities was as follows: electric power: 5.21 days; water: 3.49 days; telephone service: 3.94 days. Participants returned to work or school an average of six days after the storm struck. No participant lost his or her job as a result of the storm. More than three-quarters (77%) had adequate insurance coverage, 8% had some coverage, and 9% did not have insurance to cover their house or possessions. Six percent did not know about their insurance coverage. Four percent were physically injured during the storm or clean-up, and two percent had a family member or friend who was physically injured during the storm or clean-up.

Distress and Psychosocial Responses - Table 3 shows that less than one-tenth of the participants reported experiencing any psychological distress symptom associated with acute

stress disorder. Table 4 presents psychosocial responses related to the impact of the hurricane. More than half of the participants were angry at people who were breaking laws to get aid and supplies; believed that the storm was due to God's will; believed that neighbors, friends, police officers, military personnel, and social workers were helpful; had taken on more responsibilities, and had made new friends. More than one-third of the participants believed that insurance adjusters had been helpful, and were busy rebuilding their life. Less than one-tenth believed this happened because their nation had done something wrong, had done things they did not like to get aid and supplies, believed that the lack of aid was their fault, were reluctant to help others, had become involved in community activities, and were hurting more than other people.

United States: Mobile, Alabama

Preparation - Almost three-quarters of the participants knew that the hurricane was a threat for three or more days in advance (74%), took the hurricane warnings seriously (76%), and indicated that they were well prepared with supplies before the hurricane (81%). Table 2 shows that more than three-quarters of the participants had the following supplies on hand: bottled water, canned or dried food, batteries, candles and matches. One-third (33%) began preparing for the storm more than 24 hours in advance, 24% began preparing 16-23 hours before, and 39% began preparing less than 15 hours before the storm. Almost three-quarters (72%) of the participants had been through another natural disaster.

Property Damage and Physical Injury - Seventy percent of the participants did not have damage to their homes, 28% had minor damage, and 2% had moderate damage. The average number of days participants were without utilities was as follows: electric power: .82 days; water: .25 days; telephone service: .20 days. Participants returned to work or school an average of 3.17 days after the storm struck. Almost half (46%) had adequate insurance coverage, 7% had some coverage, and 20% did not have insurance to cover their house or possessions. However, about one-quarter (28%) did not know about their insurance coverage. One percent were physically injured during the storm or clean-up, and 3% had a family member or friend who was physically injured during the storm or clean-up.

Distress and Psychosocial Responses - Table 3 shows that less than one-tenth of the participants reported experiencing psychological distress symptoms associated with acute stress disorder. Table 4 presents psychosocial responses related to the impact of the hurricane. More than half of the participants believed that neighbors and friends were helpful. More than one-third were angry at people who were breaking the law to get aid and supplies, believed that what happened was God's will, and believed that police officers, military personnel, social workers, strangers, and insurance adjusters had been helpful. Less than one-tenth believed this happened because their nation had done something wrong, had done things they did not like to get aid and supplies, believed that the lack of aid was their fault, were reluctant to help others, had lost a lot of their savings, had become involved in community activities, and were hurting more than other people.

RESULTS: PREDICTING PSYCHOLOGICAL DISTRESS

This section presents analyses that focus on predicting psychological distress. Because the study included five locations in different countries, our approach to analyzing the data was guided by van de Vijver and Leung's (1997) recommendations for cross-national studies that include more than one location. The first series of analyses examined if location and the strength of Hurricane Georges were associated with psychological distress and accounted for a significant portion of psychological distress variance. The two central issues addressed in this analysis were the following: Because Hurricane Georges's sustained wind speed and maximum wind gusts varied across location, might storm strength account for some portion of psychological distress variance? Second, is there something unique about any given location that might account for some psychological distress variance?

We performed a hierarchical multiple regression analysis to examine the importance of storm strength, location, gender, age, exposure to traumatic events, low magnitude life stressor history, preparation, social support, resource loss, and depression in predicting acute stress disorder symptoms. The predictor variables were entered in nine blocks, based on the conservation of resources stress theory and previous research (Freedy et al., 1994; Sattler, Kaiser, and Hittner, in press). Table 5 shows that the nine predictor blocks accounted for 59% of acute stress disorder symptom variance, $F(13,529)=58.02$, $p<.0001$. The storm strength block accounted for 9% of the variance, $F(1,541)=55.46$, $p<.0001$. The location block accounted for 1% of the variance, $F(1,540)=6.33$, $p<.01$. The demographic block accounted for less than 1% of the variance, $F(2,538)=.98$, $p>.05$. The exposure to traumatic event block accounted for 3% of the variance, $F(1,537)=17.90$, $p<.0001$. The low magnitude life stressor history block accounted for less than 1% of the variance, $F(1,536)=1.14$, $p>.05$. The preparation block accounted for 1% of the variance, $F(1,535)=7.43$, $p<.01$. The social support block accounted for 5% of the variance, $F(1,534)=35.05$, $p<.0001$. The resource loss block accounted for 36% of the variance, $F(1,530)=108.54$, $p<.0001$. The depression block accounted for 3% of the variance, $F(1,529)=34.22$, $p<.0001$.

The hierarchical multiple regression analysis indicated that storm strength and location were significant predictors of acute stress disorder symptoms. Storm strength accounted for 9% for the ASD symptom variance, and location accounted for 1% of the variance. Following van de Vijver and Leung's (1997) recommendation to conduct separate analyses if location accounts for a significant portion of variance in the overall analysis, we conducted separate correlational and hierarchical multiple regression analyses for each location, which are presented below.

U. S. Virgin Islands

The first analysis examined the correlations between acute stress disorder symptoms, demographic variables, exposure to traumatic events, low magnitude life stressor history, preparation for the storm, social support, resource loss, and depression. Table 6 shows that acute stress disorder symptoms were associated with all four types of resource loss and depression. Exposure to traumatic events was associated with low magnitude life stressor history and all four types of resource loss. Low magnitude life stressor history was associated with object resource loss and energy resource loss. Social support was negatively associated with all four types of resource loss and depression.

Next, we performed a hierarchical multiple regression analysis to examine the importance of gender, age, exposure to traumatic events, low magnitude life stressor history, preparation, social support, resource loss, and depression in predicting acute stress disorder symptoms. The predictor variables were entered in seven blocks, based on the conservation of resources stress theory and previous research (Freedy et al., 1992; Freedy et al., 1994; Sattler, Kaiser, and Hittner, in press). Table 7 shows that the seven predictor blocks accounted for 66% of acute stress disorder symptom variance, $F(11,61)=10.65$, $p<.0001$. The demographic block accounted for 8% of the variance, $F(2,70)=3.14$, $p<.05$. The exposure to traumatic event block accounted for 2% of the variance, $F(1,69)=1.61$, $p>.05$. The low magnitude life stressor history block accounted for less than 1% of the variance, $F(1,68)=.11$, $p>.05$. The preparation block accounted for less than 1% of the variance, $F(1,67)=.68$, $p>.05$. The social support block accounted for 11% of the variance, $F(1,66)=8.98$, $p<.01$. The resource loss block accounted for 44% of the variance, $F(1,62)=19.51$, $p<.0001$. The depression block accounted for less than 1% of the variance, $F(1,61)=.52$, $p>.05$.

The beta column in Table 7 presents the standardized regression coefficients, or beta coefficients (*B*), for the 11 variables in the model. The beta coefficients indicate the relative effect of each variable as a predictor of acute stress disorder symptoms, partialing out all other predictor variables. More specifically, the magnitude of a beta coefficient indicates the predicted standard score change in Y that is expected, given a one standard score change in X (Darlington, 1990). For blocks that had more than one variable, the beta coefficients showed that acute stress disorder was significantly associated with object resource loss, $F(10,62)=5.48$, $p<.05$, $B = .21$, condition resource loss, $F(10,62)=12.13$, $p<.001$, $B = .49$, and personal characteristic resource loss, $F(10,20)=3.89$, $p<.05$, $B = .31$.

Puerto Rico

The first analysis examined the correlations between acute stress disorder symptoms, demographic variables, exposure to traumatic events, low magnitude life stressor history, preparation for the storm, social support, resource loss, and depression. Table 8 shows that acute stress disorder symptoms were associated with age, all four types of resource loss, and depression, and negatively associated with social support. Being female was associated with social support and negatively associated with exposure to traumatic events. Age was negatively associated with preparation. Exposure to traumatic events was associated with all four types of resource loss and negatively associated with social support. Preparation was associated with social support. Social support was negatively associated with all four types of resource loss and depression.

We performed a hierarchical multiple regression analysis to examine the importance of gender, age, exposure to traumatic events, low magnitude life stressor history, preparation, social support, resource loss, and depression in predicting acute stress disorder symptoms. The predictor variables were entered in seven blocks, based on the conservation of resources stress theory and previous research (Freedy et al., 1992; Freedy et al., 1994; Sattler, Kaiser, and Hittner, in press). Table 9 shows that the seven predictor blocks accounted for 50% acute stress disorder symptom variance, $F(11,215)=19.89$, $p<.0001$. The demographic block accounted for 3% of the variance, $F(2,224)=3.36$, $p<.05$. The exposure to traumatic event block accounted for

2% of the variance, F(1,223)=5.19, p<.05. The low magnitude life stressor history block accounted for less than 1% of the variance, F(1,222)=.50, p>.05. The preparation block accounted for less than 1% of the variance, F(1,221)=1.74, p>.05. The social support block accounted for 4% of the variance, F(1,220)=10.65, p<.001. The resource loss block accounted for 36% of the variance, F(4,216)=36.10, p<.0001. The depression block accounted for less than 4% of the variance, F(1,215)=18.00, p<.0001.

The beta column in Table 9 presents the standardized regression coefficients, or beta coefficients (*B*), for the 11 variables in the model. For blocks that had more than one variable, the beta coefficients showed that acute stress disorder symptoms were significantly associated with being female, F(2,224)=4.55, p<.05, *B* = .14; object resource loss, F(4,216)=5.63, p<.05, *B* = .13; energy resource loss, F(4,216)=7.91, p<.01, *B* = .19, and personal characteristic resource loss, F(4,216)=38.21, p<.0001, *B* = .51.

Dominican Republic

The first analysis examined the correlations between acute stress disorder symptoms, demographic variables, exposure to traumatic events, low magnitude life stressor history, preparation for the storm, social support, resource loss, and depression. Table 10 shows that acute stress disorder symptoms were associated with being exposed to traumatic events, all four types of resource loss, and depression, and negatively associated with social support. Being female was associated with social support. Age was associated with exposure to traumatic events, personal characteristic resource loss, and negatively associated with social support. Exposure to traumatic events was associated with low magnitude life stress history and energy resource loss. Low magnitude life stress history was associated with object resource loss, energy resource loss, and personal characteristic resource loss. Preparation was associated with social support and negatively associated with object resource loss. Social support was negatively associated with all four types of resource loss and depression.

Next, we performed a hierarchical multiple regression analysis to examine the importance of gender, age, exposure to traumatic events, low magnitude life stressor history, preparation, social support, resource loss, and depression in predicting acute stress disorder symptoms. The predictor variables were entered in seven blocks, based on the conservation of resources stress theory and previous research (Freedy et al., 1992; Freedy et al., 1994; Sattler, Kaiser, and Hittner, in press). Table 11 shows that the seven predictor blocks accounted for 63% of acute stress disorder symptom variance, F(11,95)=14.76, p<.0001. The demographic block accounted for less than 1% of the variance, F(2,104)=.33, p>.05. The exposure to traumatic event block accounted for less than 1% of the variance, F(1,103)=1.62, p>.05. The low magnitude life stressor history block accounted for less than 1% of the variance, F(1,102)=.43, p>.05. The preparation block accounted for less than 1% of the variance, F(1,101)=.01, p>.05. The social support block accounted for 11% of the variance, F(1,100)=12.14, p<.0001. The resource loss block accounted for 46% of the variance, F(4,96)=26.35, p<.0001. The depression block accounted for 5% of the variance, F(1,95)=11.58, p<.0001.

The beta column in Table 11 presents the standardized regression coefficients, or beta coefficients (*B*), for the 11 variables in the model. For blocks that had more than one variable,

the beta coefficients showed that acute stress disorder symptoms were significantly associated with object resource loss, $F(10,96)=3.78$, $p<.05$, $B = .15$; condition resource loss, $F(10,96)=4.45$, $p<.05$, $B = .26$; and personal characteristic resource loss, $F(10,96)=8.87$, $p<.01$, $B = .40$.

United States: Long Beach, Mississippi

The first analysis examined the correlations between acute stress disorder symptoms, demographic variables, exposure to traumatic events, low magnitude life stressor history, preparation for the storm, social support, resource loss, and depression. Table 12 shows that acute stress disorder symptoms were associated with exposure to traumatic events, condition resource loss, energy resource loss, personal characteristic resource loss, and depression, and negatively associated with social support. Being female was associated with social support. Exposure to traumatic events was associated with life stress history, object resource loss, condition resource loss, and depression, and negatively associated with social support. Social support was negatively associated with depression.

Next, we performed a hierarchical multiple regression analysis to examine the importance of gender, age, exposure to traumatic events, low magnitude life stressor history, preparation, social support, resource loss, and depression in predicting acute stress disorder symptoms. The predictor variables were entered in seven blocks, based on the conservation of resources stress theory and previous research (Freedy et al., 1992; Freedy et al., 1994; Sattler, Kaiser, and Hittner, in press). Table 13 shows that the seven predictor blocks accounted for 67% of acute stress disorder symptom variance, $F(11,33)=6.56$, $p<.0001$. The demographic block accounted for less than 1% of the variance, $F(2,42)=.20$, $p>.05$. The exposure to traumatic event block accounted for 20% of the variance, $F(1,41)=10.05$, $p<.01$. The low magnitude life stressor history block accounted for less than 1% of the variance, $F(1,40)=.70$, $p>.05$. The preparation block accounted for 2% of the variance, $F(1,39)=1.13$, $p>.05$. The social support block accounted for 14% of the variance, $F(1,38)=8.25$, $p<.01$. The resource loss block accounted for 29% of the variance, $F(4,35)=7.45$, $p<.0001$. The depression block accounted for less than 1% of the variance, $F(1,34)=.88$, $p>.05$.

The beta column in Table 13 presents the standardized regression coefficients, or beta coefficients (B), for the 13 variables in the model. For blocks that had more than one variable, the beta coefficients showed that acute stress disorder symptoms were significantly associated with condition resource loss, $F(10,34)=6.17$, $p<.05$, $B = .43$.

United States: Alabama

The first analysis examined the correlations between acute stress disorder symptoms, demographic variables, exposure to traumatic events, low magnitude life stressor history, preparation for the storm, social support, resource loss, and depression. Table 14 shows that acute stress disorder symptoms were associated with exposure to traumatic events, all four types of resource loss, and depression, and negatively associated with social support. Being female was negatively associated with exposure to traumatic events. Age was associated with exposure to traumatic events. Exposure to traumatic events was associated with all four types of resource

loss, and negatively associated with social support. Social support was negatively associated with all four types of resource loss and depression.

Next, we performed a hierarchical multiple regression analysis to examine the importance of gender, age, exposure to traumatic events, low magnitude life stressor history, preparation, social support, resource loss, and depression in predicting acute stress disorder symptoms. The predictor variables were entered in seven blocks, based on the conservation of resources stress theory and previous research (Freedy et al., 1992; Freedy et al., 1994; Sattler, Kaiser, and Hittner, in press). Table 15 shows that the seven predictor blocks accounted for 84% of acute stress disorder symptom variance, $F(11,77)=36.26$, $p<.0001$. The demographic block accounted for 5% of the variance, $F(2,86)=2.04$, $p>.05$. The exposure to traumatic event block accounted for 12% of the variance, $F(1,85)=12.74$, $p<.001$. The low magnitude life stressor history block accounted for less than 1% of the variance, $F(1,84)=.03$, $p>.05$. The preparation block accounted for less than 1% of the variance, $F(1,83)=.55$, $p>.05$. The social support block accounted for 10% of the variance, $F(1,82)=10.74$, $p<.01$. The resource loss block accounted for 57% of the variance, $F(4,78)=68.28$, $p<.0001$. The depression block accounted for less than 1% of the variance, $F(1,77)=.09$, $p>.05$.

The beta column in Table 15 presents the standardized regression coefficients, or beta coefficients (B), for the 13 variables in the model. For blocks that had more than one variable, the beta coefficients showed that acute stress disorder symptoms were significantly associated with object resource loss, $F(10,78)=4.63$, $p<.05$, $B = -.19$, condition resource loss, $F(10,78)=52.73$, $p<.0001$, $B = .77$, and personal characteristic resource loss, $F(10,78)=9.47$, $p<.01$, $B = .30$.

DISCUSSION

Both hypotheses were supported. At each location, the univariate correlational analyses showed that resource loss was positively associated with psychological distress. The multiple regression analyses showed that resource loss was of substantial importance among the other variables in predicting psychological distress. The overall multiple regression analysis that included all participants from all locations also indicated that storm strength and location each accounted for a significant portion of psychological distress variance. The findings suggest a dose-response relationship between resource loss and psychological distress.

Many participants reported significant levels of property damage and loss of basic services. More participants in the Dominican Republic reported *major damage* (7%) to their home and property than those on the other two islands (2-3%) or the Gulf Coast states (0%). More participants in the Dominican Republic and Puerto Rico (19% in each location) reported *moderate damage* to home and property than those in Mississippi (13%) or the other two locations (2%). More than half of the participants in Mississippi (60%) reported *minor damage*, compared to about one-third in Puerto Rico (37%) and the U.S. Virgin Islands (32%), and about one-quarter in the Dominican Republic (29%) and Alabama (28%). Almost two-thirds of those in the U. S. Virgin Islands (64%) and Alabama (70%) reported *no home damage*. Insurance coverage varied. On the islands,

no more than 35% indicated having adequate coverage, whereas almost 50% of those in the Gulf Coast reported having adequate coverage. This finding is most likely due to differences in cost and availability of insurance. Participants in Puerto Rico and the Dominican Republic also reported more disruption in basic services (e.g., no electricity and running water for about one and one-half weeks, returning to school or work after more than two weeks) than those in the U. S. Virgin Islands, Mississippi, or Alabama (e.g., no electricity and running water for a few days or less, returning to school or work less than one week).

The findings support the conservation of resources stress theory and previous research (e.g., Kaiser et al., 1996; Rubonis & Bickman, 1991; Sattler, Sattler et al., 1995; Weisath, 1993). The theory and present findings have important implications for psychological functioning following disasters. Persons may be able to reduce the negative mental health impact of natural disasters by minimizing exposure to disasters and their prolonged adverse consequences (Baum, 1991; Solomon, 1989). For example, individuals can evacuate to shelters or safe areas and thereby reduce exposure to life threat. Communities can enhance building codes, offer or require property insurance, educate the public about how to prepare for and recover from a disaster, increase the number of available shelters, and improve disaster forecasting and ways the public is notified about disaster threats. Further, relief efforts immediately after the disaster should focus on supplying resources that are essential for survival, such as food, water, shelter, clothing, and medical care. Other relief efforts should work to establish predisaster routines and normalcy in the community. Personal characteristic resources may be enhanced through instruction in stress management and effective coping strategies, and establishing social support groups (Sattler et al., 1997).

The findings indicate that social support was negatively associated with psychological distress. Disasters can significantly disrupt social support networks (Adeola, 1999; Kaniasty and Norris, 1995), and these networks may deteriorate if conditions and services (e.g., communication and transportation links) are not restored in a prompt manner. Disaster preparation programs might encourage citizens to develop informal neighborhood groups that can be prepared to offer assistance in the aftermath of a disaster. Intervention efforts might encourage survivors to become involved in collective self-help efforts, whereby families, neighbors, and others in the community help one another. Social support networks also may allow survivors to share their disaster-related experiences with others and serve as a useful means of stress management. Future research also might examine cultural differences in the symbolic meaning of disasters and attitudes toward preparedness.

Because this was a cross-national study, it is important to consider the importance of contextual variables when interpreting the findings. Hurricane Georges was weakest (a Category 1 storm) when it struck the U. S. Virgin Islands, Mississippi, and Alabama, stronger (a Category 2 storm) when it struck Puerto Rico, and strongest (a Category 3 storm) when it struck the Dominican Republic[1]. The topography and geography of each location differed. The Dominican Republic is on the island of Hispanola, and this island is larger than the islands of Puerto Rico and the U.S. Virgin Islands. The storm stuck Puerto Rico and the Dominican Republic on the southeast side of each of these islands, but Puerto Rico has a higher and more mountainous interior on its east side than either the Dominican Republic or St. Thomas (U.S. Virgin Islands), and Santo Domingo,

Dominican Republic, is located on the southeast side of the island. These features may have influenced the storm's impact.

Persons in the United States could evacuate to inland areas that would not be affected by the storm; those in the Caribbean could not evacuate to such locations. Further, it is likely that it is easier to deliver supplies and recovery equipment to mainland locations rather than island locations. Future research might examine if and how these geographic differences might be associated with attitudes about disasters and fatalistic beliefs.

Each location differed in terms of materials used to construct homes and buildings, building codes, population size and density, ethnic make-up, economic status, and primary language (cf. McEntire, 1999). Research is needed to examine how these variables are associated with psychological distress following disasters. Certain locations had more recent and extensive experience with hurricane threats and/or strikes. For example, the U.S. Virgin Islands and Puerto Rico had been struck by a hurricane within the past decade, whereas the Dominican Republic had not experienced a major hurricane in the past decade. Individuals with recent hurricane experience may be better prepared (Lindell and Perry, 1992; Sattler, Kaiser, and Hittner, in press) and have a greater understanding of disaster threats (Lehman and Taylor, 1987; Sattler, Adams, and Watts, 1995) than those without such experience. Finally, there were differences in how and when citizens at each location were informed about the impending storm. The U.S. territories (U.S. Virgin Islands, Puerto Rico) and states had continuous access to updated storm strength and track information from the National Hurricane Center; those on the Dominican Republic did not have access to the same type of information. Television is a primary means of delivering information in the U.S. territories and states, but radio is a primary source of information in the Dominican Republic. Future research might examine how delivery of disaster information and trust in weather forecasts influence preparedness and compliance with recommendations (Earle and Cvetkovich, 1995; Lindell and Perry, 1992).

As with most natural disaster studies, the sample may not represent the population at each location that was affected by the disaster. Most participants in this study were not married, did not have responsibilities that come with marriage and having a family, and most likely owned fewer possessions and property than older and married persons. However, because this was an exploratory cross-national study, our goal in selecting college students was to create groups that were as similar as possible on key demographic characteristics. Because we could not assess predisaster psychopathology, we cannot be precisely sure of the disaster's impact on psychological functioning. This methodological issue is true with most disaster studies. Our study was correlational and relied on self-report; nevertheless, Norris and Kaniasty (1992) suggest that self-report data following disasters appear to be reliable. We are currently conducting a longitudinal study to examine if any delayed mental health problems may develop in the months following this initial assessment.

AUTHOR NOTE

This project was supported by a grant to David N. Sattler and Charles F. Kaiser from the Natural Hazards Center, University of Colorado, Boulder. We are grateful to many persons whose generous assistance made this project possible. We thank the participants for completing the survey and the following persons: Mary Fran Myers, Natural Hazards Center; Shannon Schlueter and Ruth Mercado, Department of Hispanic Studies, College of Charleston; Mary Beth Porter, Andrew Preston, and Jim Hittner, Department of Psychology, College of Charleston; Vivian Olivera, Francisco Vázquez Ruiz, Guillermo Bernal, Irma Roca de Torres, Jenny Rodríguez, Wanda Rodríguez, and José Bauermeister, Department of Psychology, University of Puerto Rico; Glorisa Canino, School of Medicine, University of Puerto Rico; Juan Omar Valdez, Escula de Idiomas, Universidad APEC, Dominican Republic; Dagoberto Peña, Department of Industrial Engineering, Pontificia Universidad Católica Madre y Maestra, Recinto Santo Tomas de Aquno, Santo Domingo, Domincan Republic; Jose Achecar Cupani, Dominican Republic; Boanerges Dominguez, School of Public Health, Columbia University, University of Miami; Don Drost, Division of Science and Mathematics, University of the Virgin Islands, St. Thomas; Larry Christensen, Kati Arata, Bill Vitulli, and Jerry Downey, Department of Psychology, University of South Alabama; Darlys Alford and Michael Allen, University of Southern Mississippi-Gulf Coast. Portions of this study were presented at the American Psychological Society, Denver, Colorado, June, 1999.

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NOTE

[1] Hurricanes are classified by sustained wind speed using the Saffir-Simpson scale: Class 1 (74-95 mph; minimal damage), Class 2 (96-110 mph, moderate damage), Class 3 (111-130 mph, extensive damage), Class 4 (131-155 mph, extreme damage), Class 5 (greater than 155 mph, catastrophic damage).

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