Posttraumatic Stress and Depressive Reactions Among Nicaraguan Adolescents After Hurricane Mitch

Armen K. Goenjian, M.D.
Luis Molina, M.D.
Alan M. Steinberg, Ph.D.
Lynn A. Fairbanks, Ph.D.
Maria Luisa Alvarez, M.D.
Haig A. Goenjian
Robert S. Pynoos, M.D.

Objective: This study determined the severity of posttraumatic stress and depressive reactions among Nicaraguan adolescents after Hurricane Mitch and the relationship of these reactions to objective and subjective features of hurricane exposure, death of a family member, forced relocation, and thoughts of revenge.

Method: Six months after the hurricane, 158 adolescents from three differentially exposed cities were evaluated by using a hurricane exposure questionnaire, the Child Posttraumatic Stress Disorder Reaction Index, and the Depression Self-Rating Scale.

Results: Severe levels of posttraumatic stress and depressive reactions were found among adolescents in the two most heavily affected cities. Severity of posttraumatic stress and depressive reactions and features of objective hurricane-related experiences followed a “dose-of-exposure” pattern that was congruent with the rates of death and destruction across cities. Level of impact (city), objective and subjective features, and thoughts of revenge accounted for 68% of the variance in severity of posttraumatic stress reaction. Severity of posttraumatic stress reaction, death of a family member, and sex accounted for 59% of the variance in severity of depression.

Conclusions: After a category 5 hurricane, adolescents in heavily affected areas with extreme objective and subjective hurricane-related traumatic features of exposure experience severe and chronic posttraumatic stress and comorbid depressive reactions. The recovery of the severely affected Nicaraguan adolescents is vital to the social and economic recovery of a country ravaged by years of political violence and poverty. These findings strongly indicate the need to incorporate public mental health approaches, including systematic screening and trauma/grief-focused interventions, within a comprehensive disaster recovery program.

Hurricane Mitch, classified as a category 5 storm on the Saffir-Simpson scale, was the most deadly hurricane to strike the Western Hemisphere in the last two centuries. It struck Central America between October 26 and November 4, 1998, causing massive destruction in Nicaragua and Honduras. Approximately 10,000 people were killed. Winds reached up to 200 miles per hour. Torrential rains fell at a rate of 1–2 feet per day in many of the mountainous regions, resulting in massive floods and mudslides. Food and cash crops were largely wiped out. Hundreds of thousands of people were left without work and any means of income. Damage to basic infrastructure, agriculture production, and the industrial sector virtually destroyed more than two decades of progress in these countries.

In Nicaragua, 2 million people were directly affected; approximately 4,000 died, and 500,000 were left homeless. Intense rain falling over western Nicaragua left tens of inches of rain. Crater Lake, on top of the dormant Casita volcano, filled with water and part of the wall collapsed, causing mudflows that covered an area 10 miles long and 5 miles wide. Five villages were buried under several feet of mud. Over 2,000 of the dead were from the area around the collapsed volcano in and around the city of Posoltega.

In Chinandega there was massive flooding. Although property damage was extensive, it was comparatively less than in Posoltega. Property damage in Leon was considerably less than in the other two cities.

Children and Disasters

The two most studied hurricanes have been Hugo and Andrew. In 1989 Hurricane Hugo, classified as a category 4 storm, left 60 dead in the wake of its path of destruction across South Carolina. In 1992 Hurricane Andrew, also classified as a category 4 storm, killed 40 people in Dade County, Fla.

Shannon et al. (1), using the Child Posttraumatic Stress Disorder (PTSD) Reaction Index reported mild reaction scores (mean=21.7) among children and adolescents 3 months after Hurricane Hugo and estimated that 5% had posttraumatic stress syndrome. Belter et al. (2) reported moderate Child PTSD Reaction Index scores (range=26.9–35.1) among children 5 months after Hugo. Garrison et al. (3) also reported moderate scores (range=26–35) on the Child PTSD Reaction Index 1 year after Hugo and esti-
mated that 5% of the adolescents met DSM-III-R criteria for PTSD.

Vernberg et al. (4) found moderate (mean=29.6) Child PTSD Reaction Index scores in children 3 months after Hurricane Andrew. Garrison et al. (5), using the Diagnostic Interview Schedule in a population-based study 6 months after Hurricane Andrew, reported that 7.3% of a mixed-exposure group of adolescents met the criteria for PTSD. Shaw et al. (6), using the Child PTSD Reaction Index 32 weeks after Andrew, reported that 51% of the children in the high-impact area had moderate levels of PTSD; 38% had severe to very severe levels. Mean scores were not reported. La Greca et al. (7) reported mild to moderate scores (mean=24.4) on the Child PTSD Reaction Index 7 months after Andrew; 23% experienced moderate levels, and 18% experienced severe to very severe levels of symptoms. Shaw et al. (8) reported that 70% of the children in high-impact areas continued to score in the moderate to severe range 21 months after Andrew. With the exception of the study by Belter et al. (2), the aforementioned studies did not report on comorbid depression. Belter et al. (2) found no differences in depression scores between the different exposure groups and those reported for nonpatient standardization samples. Studies in Armenia, using the Child PTSD Reaction Index 1.5 and 3 years after the 1988 Spitak earthquake, have indicated that extreme disaster-related traumatic experiences have been associated with severe and prolonged posttraumatic stress and depressive reactions among adolescents (9, 10).

Trauma researchers have begun to employ more specific evaluations of trauma exposure in studying the impact of traumatic events on children and adolescents. Vernberg et al. (4) made a notable contribution toward refining the evaluation of exposure, with detailed exploration of objective features of hurricane-related experiences. However, their exposure questionnaire included only one item related to subjective aspects of hurricane experiences. In 1994 DSM-IV included numerous objective and subjective features of exposure. The present study incorporated these features into a hurricane exposure measure. Clinical observations after the earthquake in Armenia revealed a high prevalence of vengeful thoughts among adolescents that appeared to interfere with their recovery. Consequently, in the present study, we evaluated current thoughts of revenge.

Given the enormity of destruction, morbidity, and mortality associated with Hurricane Mitch, we considered it important to assess the severity of distress among the exposed adolescents. This study employed a “dose-of-exposure” design, using level of impact (city) as a major grouping variable. We investigated whether objective and subjective exposure, death of a family member, forced relocation after the hurricane, and current thoughts of revenge made an additional contribution toward predicting the severity of posttraumatic stress and depressive reactions beyond that made by level of impact. This study was conducted 6 months after the hurricane in three differentially affected cities in Nicaragua: 1) Posoltega, in the most devastated region, 2) Chinandega, and 3) Leon, the least devastated city.

Method

Subjects

Subjects for this study came from three public schools, one located in each of three cities in the hurricane-affected areas of Nicaragua: Posoltega (N=52), 27 boys, 25 girls, mean age=13 years, SD=0.4; Chinandega (N=55), 29 boys, 26 girls, mean age=13 years, SD=0.3; Leon (N=51), 25 boys, 26 girls, mean age=13 years, SD=0.2. Students from public schools were chosen because they were more representative of the population than students from private schools. In Posoltega and Chinandega, both seventh- and eighth-graders were evaluated. In Leon, where class size was larger, only seventh-graders were evaluated. All students present in the classrooms on the day of the evaluations completed the survey questionnaire; structured directions were given by members of our team (L.M. and M.L.A.) about how to complete the symptom scales. Four students from Posoltega, three students from Chinandega, and none from Leon were absent that day. The interview procedures were explained to the parents; the parents gave written permission for their children to participate. All of the students gave their assent after having the interview procedures explained. No parent refused to give permission for his or her child’s participation, and no student refused to be interviewed.

Instruments

A hurricane-related exposure profile was obtained for each subject. This part of the questionnaire included 13 items: four items assessed objective features of hurricane exposure, and nine items assessed subjective features (Table 1). These items were answered “yes” or “no.” Positive responses to these items were summed for the analyses. Cronbach’s alphas for internal consistency within the objective and subjective exposure scales were 0.64 and 0.55, respectively. Cities, which constituted a broad measure of level of impact, were rated: 1=Posoltega, 2=Chinandega, and 3=Leon. In addition, students were asked to describe their worst hurricane-related experience. Information was also obtained about loss of a family member due to the hurricane, forced relocation, and thoughts of revenge.

Posttraumatic stress symptoms were evaluated by using the self-reported Child PTSD Reaction Index (11). Frequency of occurrence of symptoms was rated on a 5-point Likert scale, ranging from 0=none to 4=most of the time. Prior comparisons of Child PTSD Reaction Index scores with a diagnosis of PTSD in clinical populations have suggested the following guidelines: 0–11=doubtful; 12–24=mild; 25–39=moderate; 40–59=severe; 60–80=very severe (12). Previous findings have indicated that a score of 40 or above is highly associated with a diagnosis of PTSD (13). Test-retest reliability for the Child PTSD Reaction Index was assessed by the authors. Twelve adolescents were evaluated initially and again after 7 days. The intraclass correlation coefficient for these scores was 0.93 (p<0.001).

Ratings of depressive symptoms were obtained by using the Depression Self-Rating Scale (14). Psychometric properties of this instrument have been reported. A score of 17 or above is highly associated with a diagnosis of major depression, dysthymic disorder, or adjustment disorder with depressed mood (14). A translation of all interview questions and instruments into Spanish followed published guidelines, including the use of independent back-translation (15).
Adolescent Reactions to Hurricane

TABLE 1. Endorsement Frequencies, by City, of Objective and Subjective Features of Hurricane-Related Exposure Among 158 Nicaraguan Adolescents During and After Hurricane Mitch

<table>
<thead>
<tr>
<th>Feature of Hurricane-Related Exposure</th>
<th>Posoltega (N=52)</th>
<th>Chinandega (N=55)</th>
<th>Leon (N=51)</th>
<th>Kendall's tau-b</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>During the hurricane</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Objective features</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seriously hurt</td>
<td>14</td>
<td>7</td>
<td>2</td>
<td>0.25**</td>
</tr>
<tr>
<td>Someone else seriously hurt</td>
<td>40</td>
<td>25</td>
<td>13</td>
<td>0.41**</td>
</tr>
<tr>
<td>Someone else died</td>
<td>44</td>
<td>27</td>
<td>7</td>
<td>0.54**</td>
</tr>
<tr>
<td>Home severely damaged or destroyed</td>
<td>33</td>
<td>26</td>
<td>10</td>
<td>0.33**</td>
</tr>
<tr>
<td>Subjective features</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very scared</td>
<td>50</td>
<td>51</td>
<td>46</td>
<td>0.09</td>
</tr>
<tr>
<td>Scared you would die</td>
<td>50</td>
<td>45</td>
<td>43</td>
<td>0.14*</td>
</tr>
<tr>
<td>Scared you would be hurt badly</td>
<td>44</td>
<td>49</td>
<td>45</td>
<td>0.02</td>
</tr>
<tr>
<td>Scared someone else would die</td>
<td>51</td>
<td>52</td>
<td>50</td>
<td>0.00</td>
</tr>
<tr>
<td>Scared someone else would be seriously hurt</td>
<td>51</td>
<td>51</td>
<td>50</td>
<td>0.00</td>
</tr>
<tr>
<td>Felt you couldn’t control what was happening</td>
<td>49</td>
<td>50</td>
<td>47</td>
<td>0.03</td>
</tr>
<tr>
<td>Acted nervous and confused</td>
<td>46</td>
<td>46</td>
<td>45</td>
<td>0.00</td>
</tr>
<tr>
<td>Felt what you saw was disgusting or gross</td>
<td>52</td>
<td>51</td>
<td>51</td>
<td>0.00</td>
</tr>
<tr>
<td>Felt what was happening was unreal</td>
<td>42</td>
<td>39</td>
<td>32</td>
<td>0.15*</td>
</tr>
<tr>
<td>Death of a family member</td>
<td>16</td>
<td>31</td>
<td>2</td>
<td>0.28**</td>
</tr>
<tr>
<td><strong>After the hurricane</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Objective feature: forced relocation</td>
<td>15</td>
<td>12</td>
<td>7</td>
<td>0.14*</td>
</tr>
<tr>
<td>Subjective feature: thoughts of revenge</td>
<td>28</td>
<td>10</td>
<td>12</td>
<td>0.25**</td>
</tr>
</tbody>
</table>

aData are missing for some categories.
b $p<0.05$.
*p<0.01.

Statistical Analysis

Kendall’s tau-b was used to assess differences in the frequencies of objective and subjective experiences across cities during and after the hurricane. Pearson’s product moment correlation was used to test the relationships among the independent and among the dependent variables. Multiple stepwise regression analyses were used to determine the relative contribution of demographic and hurricane-related variables to posttraumatic stress and depressive reactions.

Results

Objective and Subjective Features

Table 1 shows the frequencies of endorsement of objective and subjective exposure items by city during and after the hurricane. Objective features of exposure, both during and after the hurricane, followed a “dose-of-exposure” continuum; the highest percentages were endorsed in the most affected region, Posoltega, followed by Chinandega, and then Leon. Noteworthy in Posoltega were the rates of being seriously hurt (27%), death of a family member (31%), and having one’s home severely damaged or destroyed (63%).

Subjective features during the hurricane did not follow a dose-of-exposure pattern, with the exception of the features “scared you would die” and “felt what was happening was unreal.” Both showed significant but small differences. After the hurricane, “thoughts of revenge” were quite prevalent in Posoltega (54%), as compared to Chinandega (20%) and Leon (23%).

Correlations Among Independent Variables

Table 2 presents intercorrelations among independent variables. City (level of impact), rated as a continuous variable, was significantly correlated with objective hurricane-related experiences but not with subjective experiences. City was also significantly correlated with death of a family member and current thoughts of revenge. There was a significant correlation between sex and endorsement of subjective experiences but not between sex and endorsement of objective experiences. Girls had significantly higher scores than boys on the subjective exposure scale. With the exception of sex, all other variables were significantly correlated with objective experiences.

Worst Hurricane-Related Experience

Representative examples of responses regarding worst hurricane-related experiences included the following: “I felt the mudslide was pulling me down. The mud ruined my house. I felt we were all going to die, and if we managed to survive, we were all going to starve to death because there was no food.” “I felt that the mud was covering us, and it was going to swallow us up.” “I felt the mud and rocks would drag us. I felt very afraid that I was going to drown, or my family was going to drown. The house was dragged by the wind.” “I was very afraid because the winds took the roof and the water came into the house.”

Posttraumatic Stress and Depressive Reactions

Figure 1 presents the mean Child PTSD Reaction Index and Depression Self-Rating Scale scores for boys and girls in the three cities 6 months after Hurricane Mitch. Child PTSD Reaction Index and Depression Self-Rating Scale scores followed a dose-of-exposure pattern, with the highest scores endorsed in the most affected region: Posoltega, followed by Chinandega, and then Leon. The severity of these reactions across cities was congruent with the rates of positive responses to the objective hurricane-related exposure items. Adolescents in Posoltega, who reported
the highest levels of objective exposure, had the highest Child PTSD Reaction Index scores (boys: mean=55.7, SD=15.2; girls: mean=61.6, SD=8.9; total: mean=58.6, SD=12.8). Adolescents in Chinandega reported the next-highest levels of exposure (boys: mean=37.9, SD=11.2; girls: mean=45.7, SD=15.6; total: mean=41.6, SD=13.9), followed by adolescents in Leon (boys: mean=26.9, SD=16.3; girls: mean=28.8, SD=10.8; total: mean=27.9, SD=13.7). Mean Depression Self-Rating Scale scores for the three cities were: Posoltega (boys: mean=19.7, SD=8.3; girls: mean=25.1, SD=5.9; total: mean=22.3, SD=7.7); Chinandega (boys: mean=16.9, SD=6.6; girls: mean=17.6, SD=7.1; total: mean=17.2, SD=6.8); and Leon (boys: mean=10.9, SD=6.0; girls: mean=16.0, SD=5.6; total: mean=13.5, SD=6.3).

PTSD, Depressive Disorder, and Their Co-Occurrence

Empirically derived cutoff scores for both the Child PTSD Reaction Index and Depression Self-Rating Scale were used to derive estimates by city of the current frequency of PTSD, depressive disorder, and their co-occurrence 6 months after the hurricane. The estimated rates were as follows: Posoltega (N=52): PTSD, N=47, 90%; depressive disorder, N=42, 81%; comorbid PTSD and depressive disorder, N=41, 79%; Chinandega (N=55): PTSD, N=30, 55%; depressive disorder, N=28, 51%; comorbid PTSD and depressive disorder, N=21, 38%; Leon (N=51): PTSD, N=7, 14%; depressive disorder, N=15, 29%; comorbid PTSD and depressive disorder, N=4, 8%. Estimated rates of PTSD, depressive disorder, and their co-occurrence 6 months after the hurricane were high in the two most severely affected regions, Posoltega and Chinandega. Considerably lower estimated rates were found in Leon, where exposure was less severe.

PTSD and Depression Scores

For the total group, the correlation between Child PTSD Reaction Index and Depression Self-Rating Scale scores was r=0.74 (df=126, p<0.001). Within-city correlations were also high: Posoltega: r=0.81 (df=50, p<0.001), Chinandega: r=0.56 (df=53, p<0.001), and Leon: r=0.62 (df=51, p<0.001).

Severity of Posttraumatic Stress Reaction

Table 3 presents a stepwise multiple regression analysis of the contribution of each of the independent variables toward predicting severity of posttraumatic stress reaction. It displays the adjusted R², the change in R², the standardized regression coefficient (beta), and partial correlations. At step 1, the strongest predictor of posttraumatic stress reaction severity was level of impact (city), which accounted for 47% of the total variance. The next variable contributing significantly was objective hurricane-related exposure, accounting for another 12% of the variance. This was followed, at step 3, by subjective hurricane-related experiences, which accounted for another 7% of the variance. Finally, at step 4, current thoughts of revenge made a significant contribution, adding another 2% to the prediction of variance in posttraumatic stress reaction severity. These four variables taken together explained 68%.
of the variance in Child PTSD Reaction Index scores. Sex, death of a family member, and forced relocation made no significant independent contribution toward predicting posttraumatic stress reaction severity.

**Severity of Depression**

Table 4 presents a stepwise multiple regression analysis of the contribution of each of the independent variables and Child PTSD Reaction Index score toward predicting severity of depression. It displays the adjusted $R^2$, the change in $R^2$, the standardized regression coefficient (beta), and partial correlations. At step 1, the strongest predictor of severity of depression was Child PTSD Reaction Index score, which accounted for 55% of the total variance. The next variable contributing significantly was death of a family member, which accounted for another 2% of the variance in depression severity. At step 3, sex accounted for an additional 2% of the variance. These three variables taken together explained 59% of the variance in depression score. Level of impact (city), objective and subjective features, forced relocation, and current thoughts of revenge made no significant independent contribution toward predicting severity of depression.

**Discussion**

The hurricane exposure scales, based on DSM-IV PTSD category A criteria, were included in order to investigate the relationship between objective and subjective hurricane-related experiences and subsequent posttraumatic stress and depressive reactions. Responses across cities to the objective exposure questions, both during and after the hurricane, followed a dose-of-exposure pattern that was congruent with the magnitude of death and destruction in the region. The high correlation between level of impact (city) and the objective exposure scale indicates that these objective exposure items are useful for measuring gradation of exposure to hurricane-related trauma.

Subjects from Posoltega and Chinandega had higher rates of objective hurricane-related experiences than the subjects studied after Hurricanes Hugo and Andrew. For example, the rate of “getting hurt” in the “high-impact” group after Hurricane Andrew was 4.8% (6). The rate of getting hurt “some to a great deal” was 4% after Hurricane Hugo (3). In contrast, the rate of being seriously injured was 27% in Posoltega and 13% in Chinandega. The rate of “seeing someone else getting injured” was 11.3% in the Andrew group versus 80% in Posoltega. While the total number of dead in Florida and South Carolina were about 40 and 60 respectively, 16 of 52 adolescents in this study in Posoltega reported the loss of a family member.

With regard to the subjective exposure scale, most reactions did not follow a dose-of-exposure pattern. There was no significant correlation between level of impact (city) and the subjective exposure scale. The lack of specificity of the subjective scale in detecting hurricane impact may be due to the fact that the severity of subjective hurricane-related experiences in all three cities produced a ceiling effect with regard to responses to these items. Use of an intensity rating scale rather than a “yes” or “no” response...
Adolescents from Posoltega had the highest mean score on the Child PTSD Reaction Index, followed by those from Chinandega, and then those from Leon. Mean Child PTSD Reaction Index score and estimated rates of PTSD also followed a dose-of-exposure pattern across cities. These findings replicate those from other postdisaster studies in demonstrating a dose-of-exposure relationship between the severity of PTSD symptoms and the magnitude of disaster impact (6, 13).

The severity of posttraumatic stress reactions in Posoltega and Chinandega far exceeded reported severity levels after Hurricanes Hugo (1–3) and Andrew (4, 6, 7), in which the same PTSD instrument was used. These higher scores reflect the more severe objective hurricane-related traumatic exposures among adolescents in these cities. These adolescents experienced being dragged under by mud, afraid that they and their family members were going to be buried alive. They were afraid that the wind would carry them and their houses away.

The Child PTSD Reaction Index score in Posoltega (mean=58.6) 6 months after the hurricane is comparable to the 1.5-year postearthquake Child PTSD Reaction Index score of adolescents (mean=54.2) near the epicenter of the devastating earthquake in Armenia (9). The comparability of these scores indicates that exposure to catastrophic disaster results in severe levels of PTSD symptoms, irrespective of type of natural disaster. High levels of depressive symptoms were found in Posoltega and Chinandega. Few studies have assessed depression in children after natural disasters. Belter et al. (2) noted no significant depression among children 5 months after Hurricane Hugo, while Goenjian et al. (9) reported high levels of depression among children and adolescents near the epicenter 1.5 years after the earthquake in Armenia. Yule and Udwin (16) and Goenjian et al. (10) found an increase in levels of depression over time among adolescents with chronic PTSD. The latter two studies suggest that adolescents in Posoltega and Chinandega may be at risk for a worsening course of depression.

This study examined a conceptual model for the prediction of severity of posttraumatic stress and depressive reactions. In addition to the anticipated contribution of objective hurricane-related traumatic experiences, subjective registration of danger, horror, and helplessness also contribute to predicting posttraumatic stress reactions. These findings lend empirical support to DSM-IV criterion A.

This study found a small but significant predictive value of having current thoughts of revenge for severity of posttraumatic stress reaction. Vengeful thoughts as a consequence of human-perpetrated trauma have been described in the literature (17). In this study, vengeful thoughts (54%) were prevalent in the most exposed group, the adolescents from Posoltega. Most adolescents expressed vengeful thoughts toward the government for not warning them in advance or helping them during or after the hurricane. This finding indicates that vengeful thoughts may be prevalent after natural disasters as well as after human-perpetrated violence and points to the need to evaluate and address them in treatment.

The lack of contribution of forced relocation for predicting severity of posttraumatic stress reaction is consistent with the results of prior studies among survivors of an earthquake (18). With regard to the lack of contribution of death of a family member, prior studies have found higher levels of PTSD symptoms among those who suffered the death of a nuclear family member (9, 13). However, these studies did not specifically control for objective and subjective features of exposure. In the present study, even though loss of a family member was significantly correlated with PTSD severity at step 0, it did not make an additional contribution toward predicting PTSD severity beyond level of impact (city), aspects of hurricane exposure, sex, and thoughts of revenge.

In this study, sex was predictive of the severity of posttraumatic stress reactions at steps 1 and 2. However, after controlling for the contribution of subjective features of exposure, sex no longer made an independent contribution. A number of prior disaster studies have found that girls scored higher than boys on PTSD measures (1, 4, 5, 9, 13), but none of these controlled for subjective exposure. This finding raises new questions in regard to sex differences in PTSD. Do girls experience higher levels of posttraumatic stress reaction because they experience more fear, horror, and helplessness (items on the subjective exposure scale) during a catastrophic disaster than boys? Or do the sex differences reflect a more general willingness on the part of girls to endorse items on both the subjective exposure and PTSD scales?

This study found that three variables, Child PTSD Reaction Index score, death of a family member, and sex, accounted for 59% of the variance in depression, 55% of which was due to severity of posttraumatic stress reaction. There was also a high correlation between Child PTSD Reaction Index and Depression Self-Rating Scale scores. One explanation may be that adolescents in the heavily affected cities both 1) had the most extreme hurricane-related traumatic exposures (resulting in severe levels of posttraumatic stress reaction) and 2) suffered the harshest posthurricane losses and adversities (resulting in severe levels of depression). In addition, PTSD symptoms may have given rise to, or exacerbated, depressive symptoms (9, 19), or prior history of depression may increase vulnerability to PTSD (20). The significant contribution of the death of a family member to severity of depression is congruent with the childhood bereavement and trauma literature (9, 21, 22). The significant contribution of sex toward predicting severity of depression is consistent with the results of epidemiological studies indicating that depressive...
disorders show a change in sex distribution after puberty, when rates for girls begin to exceed those for boys (23).

This study indicates that after a category 5 hurricane, adolescents in heavily affected areas with extreme objective and subjective hurricane-related traumatic exposure experience chronic and severe levels of posttraumatic stress and depressive symptoms. There is accumulating evidence that these sequelae have adverse effects on their future development, including conscience functioning, academic achievement, economic productivity, health, and the stability they bring to marriage, family life, and their societal role (24–27). The recovery of adolescents in Nicaragua is vital to the social and economic recovery of a country already ravaged by years of political violence and poverty. Comprehensive disaster recovery programs need to incorporate modern public health approaches, including systematic screening of affected populations, stratification of interventions on the basis of risk assessment, provision of trauma/grief-focused interventions, and monitoring course of recovery (28).

Received July 5, 2000; revision received Oct. 31, 2000; accepted Nov. 16, 2000. From the Trauma Psychiatry Program, Department of Psychiatry and Biobehavioral Sciences, University of California at Los Angeles. Address reprint requests to Dr. Goenjian, 501 Via La Selva, Redondo Beach, CA 90277; agoenjian@aol.com (e-mail).

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