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The contribution of pre- and postdisaster social support to short- and long-term mental health after Hurricanes Katrina: A longitudinal study of low-income survivors



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ABSTRACT

A previous study of Hurricane Katrina survivors found that higher levels of pre-disaster social support were associated with lower psychological distress one year after the storm, and that this pathway was mediated by lower exposure to hurricane-related stressors. As a follow-up, we examined the impact of pre- and postdisaster social support on longer-term of mental health—both psychological distress and posttraumatic stress. In this three-wave longitudinal study, 492 residents in the region affected by Hurricane Katrina reported levels of perceived social support and symptoms of psychological distress prior to the storm (Wave 1). Subsequently, one year after Hurricane Katrina (Wave 2), they reported levels of exposure, perceived social support, and symptoms of psychological distress and posttraumatic stress. The latter three variables were assessed again four years after the hurricane (Wave 3). Results of mediation analysis indicated that levels of exposure to hurricane-related stressors mediated the relationship between Wave 1 perceived social support and Wave 3 psychological distress as well as post-disaster posttraumatic stress. Results of regression analyses indicated that, controlling for Wave 1 psychological distress and disaster exposure, Wave 2 perceived social support was associated with Wave 2 and Wave 3 psychological distress but not posttraumatic stress. Our results confirmed the social causation processes of social support and suggest that posttraumatic stress might not stem directly from the lack of social support. Rather, preexisting deficits in social resources might indirectly affect longer-term posttraumatic stress and general psychological distress by increasing risk for disaster-related stressors.

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Hurricane Katrina was one of the most destructive natural disasters in recent history of the United States, accounting for close to 2000 deaths and the displacement of more than 650,000 people (Knabb et al., 2005; National Oceanic and Atmospheric Administration, 2005). The hurricane led to heightened degrees of psychiatric symptoms among survivors, especially those who were already facing challenging life circumstances prior to the storm (Galea et al., 2007; Kessler et al., 2006; Paxson et al., 2012; Rhodes et al., 2010; Wang et al., 2007; Weisler et al., 2006).

Nonetheless, there is considerable variability in the extent survivors are able to cope following a large-scale disaster (Norris et al.,

2002). A better understanding of the sources of variation could have implications for public health initiatives to prevent adverse outcomes before and after a disaster. Among the protective factors that have been examined in the context of disaster, perceived social support appears to be one of the most promising ones. A comprehensive review of disaster literature found that higher levels of perceived social support were consistently associated with lower psychiatric symptoms (Norris et al., 2002). Significant negative associations have likewise been detected in several cross-sectional studies in the aftermath of Hurricane Katrina, with timeframes spanning from two to five months to upwards of 18–24 months postdisaster (Galea et al., 2008; Weems et al., 2007).

The literature provides strong evidence that higher perceived social support is a cross-sectional predictor of fewer psychological symptoms. Nonetheless, a limitation of the literature is whether

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pre-disaster perceived social support is negatively associated with postdisaster mental health. An improved understanding of the role of *pre-disaster* social resources would provide critical insights for public health interventions to build resilience against disasters and other catastrophic events. There is one notable exception to this gap in the existing literature, which found that a study of pre-disaster social support decreased significantly from pre- to postdisaster, and that pre-disaster social support negatively correlated with general psychological distress (GPD) one year postdisaster among Hurricane Katrina survivors (Lowe et al., 2010). Mediation analyses controlling for pre-disaster psychological distress further showed that the relationship between higher pre-disaster social support and lower postdisaster psychological distress was mediated by exposure to fewer hurricane-related stressors. Although this finding provided some insight into the protective function of pre-disaster social support, it remains unclear if these results would persist into the longer-term (i.e., greater than one year) after Hurricane Katrina. Furthermore, it is unknown whether the associations found with GPD would extend to other psychological symptoms, most notably, posttraumatic stress (PTS) symptoms. PTS symptoms have been included in the vast majority of postdisaster investigations, yet they were excluded from this particular study's analyses (Norris et al., 2002).

Although studies have shown that pre-disaster perceived social support may have a protective function on postdisaster psychological distress, it is unclear whether postdisaster perceived social support is a *prospective* predictor of later psychological functioning. No published study to our knowledge has assessed the relationship between postdisaster perceived social support and mental health using multiple waves of data following Hurricane Katrina. Nonetheless, a study involving fewer than 100 survivors of a major flood found that higher perceived social support was associated with lower depression, anxiety, and somatization symptoms at one, two and four months postdisaster, but not at five months postdisaster (Cook and Bickman, 1990). A more recent study explored bidirectional relationships between perceived social support and PTS over time using a crosslagged model (Kaniasty and Norris, 2008). Researchers found that *social causation*, e.g., lower social support at one time point associated with higher PTS symptoms at the following time point, was evident between six and 12 months and 12 and 18 months postdisaster. In contrast, *social selection*, e.g., higher PTS symptoms at one time point associated with lower perceived social support at the following time point, was evident between 12 and 18 months and 18 and 24 months postdisaster (Kaniasty and Norris, 2008).

1. Current study

The purpose of this study was to extend the findings from Lowe et al. (2010) by examining the association between both pre- and postdisaster perceived social support and longer-term psychological outcomes, specifically, GPD and PTS. We included the same sample but examined an additional wave of follow-up data, collected approximately four years after Hurricane Katrina. We focused on whether perceived social support has increased from one- to four-year postdisaster, and whether the mediational relationship between pre-disaster perceived social support and postdisaster symptoms through hurricane-related stressors held for both outcomes at four-year postdisaster. Subsequently, we examined the impact of one-year postdisaster perceived social support on one and four-year postdisaster psychological outcomes. As in Lowe et al. (2010), we controlled for pre-disaster GPD to provide more precise estimates of the relationship between social support and postdisaster psychological outcomes.

2. Methods

2.1. Participants and procedure

This study includes three waves of data from a larger multi-wave longitudinal study (Paxson et al., 2012). Participants of the current study were residents of the greater New Orleans region who survived Hurricanes Katrina and Rita. As part of a study of an educational intervention, 492 single parents who were attending community college completed a comprehensive questionnaire prior to Hurricane Katrina (Wave 1) (Brock and Richburg-Hayes, 2006). Subsequently, 402 of the respondents were successfully contacted and interviewed between May 2006 and March 2007, approximately one year after the hurricanes (Wave 2). A follow-up (Wave 3) was conducted between April 2009 and March 2010, approximately four years after the hurricanes ($n = 348$). Readers are referred to Paxson et al. (2012) for further details about the sample and procedure of the original study. Ethics approval was granted by three institutions and informed consent provided by all participants included in the current study.

2.2. Measures

General Psychological Distress (Waves 1, 2 and 3) was measured with the K6 scale (Kessler et al., 2002), a six-item measure of non-specific psychological distress with good psychometric properties (Furukawa et al., 2003). Respondents answered on a 5-point Likert-type scale ranging from 1 (*All the time*) to 5 (*None of the time*). Cronbach's alpha of the K6 scale in this study was .72, .80, and .81 at Waves 1, 2 and 3, respectively. A composite score was calculated and used for the GPD, with higher scores reflecting higher symptom severity.

Posttraumatic stress (Waves 2 and 3) was measured with the Impact of Event Scale-Revised (IES-R), a 22-item self-report inventory of PTS disorder symptoms (Weiss and Marmar, 1997), with good psychometric properties (Creamer et al., 2003). The IES-R has three subscales that assess the intensity of intrusion, hyperarousal and avoidance reactions, respectively. Participants answered the questions using a 5-point Likert-type scale, ranging from 0 (*Not at all*) to 4 (*Extremely*). Cronbach's alpha for the three IES-R subscales ranged from .86 to .92 for Waves 2 and 3. A total PTS score was created for each wave using the sum of all the items, with higher scores corresponding to higher levels of symptomology.

Perceived social support (Wave 1 and 2) was measured with an abbreviated form of the Social Provisions Scale (SPS) (Cutrona and Russell, 1987). Items from the reliable alliance, guidance, social integration, and reassurance of worth subscales were used. Participants rated the 8-item scale using a 4-point Likert-type scale, ranging from 1 (*Strongly disagree*) to 4 (*Strongly agree*). Cronbach's alpha was .83 at Wave 1 and .82 at Wave 2. An average score was created for perceived social support, with higher scores corresponding to higher perceived support.

Hurricane exposure (Wave 2). Disaster-related stressors were measured using 12 self-report questions on losses and lack of resources during Hurricanes Katrina and Rita. All responses were dichotomous ("No" = 0, "Yes" = 1). Participants were asked in the Wave 2 survey to indicate if they experienced any of the following as a result of Hurricanes Katrina and/or Rita: 1) no fresh water to drink, 2) no food to eat, 3) lacked necessary medicine, 4) lacked necessary medical care, 5) had a family member who lacked necessary medical care, 6) lacked knowledge of safety of their children, and 7) lacked knowledge of safety of their other families members. In addition, participants were asked: 8) whether there was any death among family and friends, 9) whether they had lost property, 10) whether they had lost a vehicle, 11) whether a family

pet had died or been lost due to the hurricanes and their aftermath, and 12) whether they evacuated before the hurricane arrived. Their responses for the two hurricanes were then combined and dichotomized such that “1” indicated the experience of the particular disaster-related stressors in either of the two hurricanes. A total score was created for hurricane exposure, ranging from 0 to 12, and this reflected the number of disaster-related stressors experienced.

Demographic information (Wave 1). Participants provided information regarding their age, gender, race/ethnicity, number of children, and socioeconomic status (i.e., participation in government assistance programs, monthly income).

2.3. Statistical analysis

Statistical analysis for this study consisted of three steps. First, changes in perceived social support from Wave 2 to Wave 3 (i.e., one to four years postdisaster), and from Wave 1 to Wave 3 (i.e., pre-to-four years postdisaster) were assessed using paired sample *t*-tests.

Second, to test whether exposure to hurricane-related stressors mediated the relationship between Wave 1 perceived social support and GPD and PTS at Wave 3, a mediation analysis with bootstrapping resampling procedure was conducted with the *Lavaan* package in R (Models I and II) (Bollen and Stine, 1990). An indirect effect was considered statistically significant at the .5 level if the 95% confidence interval for the estimate did not contain zero (Shrout and Bolger, 2002).

Third, linear multivariate regression analyses were performed to examine the effects of Wave 2 perceived social support on GPD and PTS at Wave 2 (Model III) and Wave 3 (Model IV), controlling for age, the number of children, Wave 1 GPD, and hurricane-related stressors (i.e., exposure). In both models, the covariance between the two endogenous variables (i.e., GPD and PTS) was controlled for.

At the item-level, 14.8% of observations were missing, which were handled using the full information maximum likelihood approach. All analyses were conducted in R, including the treatment of missing data.

3. Results

Demographic information on the included sample is presented in Table 1. Most participants were women (96.0%) and, prior to the Hurricane, most were unmarried (77.2%), and had one or two children (67.4%). Among those who reported, 65.9% were

themselves, or a household member was, receiving some government assistance, such as food stamps. The average predisaster monthly income of the participants was low (Mean = \$669; *SD* = \$703).

The results from paired-sample *t*-tests indicated that levels of perceived social support did not change from Wave 2 to Wave 3 [$t(344) = -1.64, p > .05$], but there was a significant reduction in perceived social support from Wave 1 to Wave 3 [$t(405) = -2.77, p < .01$].

Prior to the mediation and linear regression analyses, zero-order correlations were used to evaluate the relationship between the variables included in the analyses. The zero-correlation matrix is presented in Table 2.

3.1. Mediation analysis (predisaster)

Mediation analysis with bootstrapping resampling procedures was used to examine whether hurricane-related stressors measured at Wave 2 mediated the relationship between Wave 1 perceived social support and Wave 3 mental health outcomes (i.e., GPD and PTS). After controlling for age and Wave 1 GPD, exposure measured at Wave 2 mediated the association between Wave 1 perceived social support and both GPD (Model I) and PTS (Model II) at Wave 3 (Table 3).

3.2. Multivariable linear regression (postdisaster)

Multivariable linear regression analyses were conducted to examine the effects of Wave 2 perceived social support on GPD and PTS at Waves 2 and 3, controlling for age, number of children, Wave 1 GPD, and hurricane-related stressors (Table 4). As shown in Model III, Wave 2 perceived social support was a predictor of Wave 2 GPD ($\beta = -.22, p < .001$), but not PTS ($\beta = .01, p > .05$). In Model IV, Wave 2 perceived social support remained as a significant predictor of GPD at Wave 3 ($\beta = -.15, p < .001$), and consistent with Model III, there was no association between Wave 2 perceived social support and Wave 3 PTS ($\beta = -.04, p > .05$). In both models, higher levels of Wave 1 GPD and exposure to a greater number of hurricane-related stressors were found to be associated with higher levels of GPD and PTS (see Table 4).

4. Discussion

The primary purpose of this study was to examine the influence of predisaster and postdisaster perceived social support on GPD and PTS after Hurricane Katrina. We found that decreased perceived social support from pre-to postdisaster reported previously remained significant at four-year postdisaster (Lowe et al., 2010), and that there was no change in perceived social support between the two postdisaster assessments. We also extended previous findings to show that the influence of *predisaster* perceived social support on four-year postdisaster GPD was mediated by exposure to fewer hurricane-related stressors (Lowe et al., 2010). Furthermore, we examined the impact of postdisaster perceived social support on longer-term mental health outcomes. Our results suggest that higher levels of one-year postdisaster perceived social support significantly associate with lower levels of postdisaster GPD at one- and four-year postdisaster. In contrast, postdisaster perceived social support was not significantly related to PTS at one- or four-year postdisaster.

The results of the current study add to a growing literature on social resources and postdisaster psychological functioning. We showed that the previously published association between higher levels of predisaster perceived social support and lower post-disaster distress, mediated through exposure to fewer hurricane-

Table 1
Demographic information on sample (N = 492).

Characteristic	Mean (SD)
Age (years)	25.5 (4.4)
Female	95.3%
Race	
Black	85.2%
Non-Hispanic White	10.4%
Hispanic	2.7%
Other	1.7%
Number of children	1.9 (1.1)
Marital Status: Single	74.0%
Receiving public assistance ^a	65.9%
Monthly income (personal)	\$668.7 (\$702.9)
Monthly income (household)	\$2504.2 (\$1533.3)

Note.

^a Represents respondents who themselves or a household member were receiving some form of government assistance, including: food stamps (58.5%), supplemental security income (16.3%), cash assistance or welfare (6.9%), unemployment or dislocate worker benefits (1.0%).

Table 2
Zero-order correlation matrix of the variables included in analyses.

Included variables ^a	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Age (years)	–											
2. Female	–.08	–										
3. Number of Children	.33***	.03	–									
4. Exposure	.13**	.07	.21***	–								
5. Predisaster SS	.05	.06	–.05	–.17*	–							
6. One-year postdisaster SS	–.06	.07	–.16**	–.18***	.38***	–						
7. Four-year postdisaster SS	–.06	.15**	–.03	–.14*	.39***	.39***	–					
8. Predisaster GPD	–.02	–.02	.03	.14**	–.28***	–.11*	–.19***	–				
9. One-year postdisaster GPD	.08	.03	–.01	.27***	–.14**	–.27***	–.22***	.36***	–			
10. Four-year postdisaster GPD	.04	–.07	.04	.21***	–.08	–.20***	–.20***	.30***	.50***	–		
11. One-year postdisaster PTS	.17***	.04	.07	.39***	–.12*	–.07	–.07	.26***	.48***	.31***	–	
12. Four-year postdisaster PTS	.19***	.03	.04	.40***	–.07	–.11	–.05	.16**	.34***	.35***	.53***	–
Mean value	25.54	95.3%	1.94	4.77	2.28	2.18	2.21	5.53	6.65	5.61	33.25	26.76
Standard Deviation	4.42	–	1.03	2.85	.48	.48	.47	4.21	5.17	4.84	22.92	21.47

Note. **p* < .05; ***p* < .01; ****p* < .001. Predisaster = Wave 1. One-year postdisaster = Wave 2. Four-year postdisaster = Wave 3. GPD = General psychological distress. PTS = Posttraumatic stress. SS = Perceived social support.

^a **Pre- and postdisaster SS** was measured using an abbreviated 8-item Social Provisions Scale (Cutrona and Russell, 1987); an average score was created with higher values corresponding to higher levels of SS. **(Hurricane) Exposure** reflects the number of disaster-related stressors experienced during Hurricanes Katrina and Rita (range: 0–12); exposure was measured using 12 self-report questions on losses and lack of resources. **Pre- and postdisaster GPD** was measured using the K6 scale (Kessler et al., 2002), a 6-item measure of non-specific psychological distress; a composite score was calculated with higher scores reflecting higher symptom severity. **Postdisaster PTS** was measured using the 22-item Impact of Event Scale-Revised (Weiss and Marmar, 1997), a self-report inventory of PTS disorder symptoms; a total score was created with higher scores corresponding to higher levels of symptomology.

Table 3
Mediation analyses with bootstrapping: Predicting four-year postdisaster outcomes (N = 492).

Mediation Models ^{a,b}	Standardized estimate	95% confidence interval ^c	
		Lower	Upper
Model I: Predisaster SS → Exposure → GPD	–.04	–.08	–.01
Model II: Predisaster SS → Exposure → PTS	–.32	–.57	–.11

Note. GPD = General psychological distress. PTS = Posttraumatic stress. SS = Perceived Social Support.
^a Age (years) and predisaster GPD were controlled for in both models.

^b **Predisaster SS** was measured using an abbreviated 8-item Social Provisions Scale (Cutrona and Russell, 1987); higher values reflect higher SS. **(Hurricane) Exposure** represents the number of disaster-related stressors (0–12) experienced during Hurricanes Katrina and Rita. **Postdisaster GPD** was measured using the 6-item K6 scale (Kessler et al., 2002); higher scores reflect higher symptom severity. **Postdisaster PTS** was measured using the 22-item Impact of Event Scale-Revised (Weiss and Marmar, 1997); higher scores reflect higher levels of PTS disorder symptomology.

^c An indirect effect was considered statistically significant at the .5 level if the 95% confidence interval for the estimate did not contain zero.

related stressors, extends to four years postdisaster (Lowe et al., 2010). The findings are in contrast with previous studies that

Table 4
Multivariable linear regression models predicting mental health outcomes at one- and four-year post-Hurricane Katrina (N = 492).

Predictor variables ^b	Model III (Wave 2) ^{a,b}		Model IV (Wave 3) ^{a,b}	
	One-year post-Katrina		Four-year post-Katrina	
	GPD	PTS	GPD	PTS
Age (years)	.08	.15**	.03	.17**
Female	.06	.04	–.06	.04
Number of Children	–.13	–.06	–.03	–.09
Predisaster GPD (Wave 1)	.32***	.22***	.29***	.11*
Exposure	.20***	.35***	.16**	.38***
Postdisaster SS (Wave 2)	–.22***	.02	–.15**	–.03
R²	.23	.21	.15	.20

Note. GPD = General psychological distress. PTS = Posttraumatic stress. SS = Perceived social support. **p* < .05; ***p* < .01; ****p* < .001.

^a Standardized regression coefficients are presented for postdisaster mental health outcomes.

^b **Pre- and postdisaster GPD** was measured using the 6-item K6 scale (Kessler et al., 2002); higher scores reflect higher symptom severity. **(Hurricane) Exposure** represents the number of disaster-related stressors (0–12) experienced during Hurricanes Katrina and Rita. **Postdisaster SS** was measured using an abbreviated 8-item Social Provisions Scale (Cutrona and Russell, 1987); higher values reflect higher SS. **Postdisaster PTS** was measured using the 22-item Impact of Event Scale-Revised (Weiss and Marmar, 1997); higher scores reflect higher levels of PTS disorder symptomology.

higher social support might only be predictive of concurrent and retrospective reporting of mental health symptoms (Cook and Bickman, 1990), and that social causation processes, wherein lower levels of perceived social support are predictive of later psychiatric symptoms, might only operate in the short-term post-disaster period (Kaniasty and Norris, 2008). One potential explanation of this divergence is that, given the large economic impact of Hurricane Katrina coupled with the relatively low predisaster socioeconomic status of our sample, perceived social support played a more significant role in this group of survivors' well-being comparatively.

On the other hand, we showed that postdisaster social support was not associated with PTS at either postdisaster time point. In this sense, our results are consistent with previous research that suggests social causation might not explain variation in PTS symptoms in the longer-term aftermath of disasters (Kaniasty and Norris, 2008). Therefore, it seems that the prospective relationship between postdisaster perceived social support and postdisaster mental health outcomes is limited to GPD and does not extend to PTS. One possible explanation of our findings is that GPD are more strongly and directly related to social circumstances, but in contrast, PTS symptoms are more influenced by hurricane-related stressors. In support of this interpretation, a population-based study in the aftermath of Hurricane Ike found that lower education and household income, higher lifetime stress, and a greater number of hurricane-related exposure and stressors were

associated with higher levels of depression (Tracy et al., 2011). Nonetheless, only hurricane-related experiences (exposures, stressors and traumatic events) were significant predictors of PTS (Chan and Rhodes, 2014). These findings led Tracy et al. (2011) to conclude that, “while [posttraumatic stress disorder] is indeed a disorder of event exposure, risk of depression is more clearly driven by personal vulnerability and exposure to stressors” (p. 674).

Our findings are an extension of this conclusion, by showing that although PTS might not stem directly from personal vulnerability, preexisting deficits in social resources may nonetheless exert indirect effects on both PTS and GPD by increasing the risk for hurricane-related stressors. As such, studies that focus solely on the direct effects of hurricane exposure might miss the more complex relationships between social resources and psychological symptoms. In doing so, their results may underestimate the influence of predisaster resources on a broad array of mental health outcomes. In a similar vein, additional information is needed regarding the indirect pathways of predisaster perceived social support and postdisaster mental health. In the previous study, several pathways were proposed, including greater access to transportation and shelter for escaping hurricane exposure and less catastrophic appraisals of hurricane-related stressors (Lowe et al., 2010). Future research that explores these pathways empirically would shed important light on how predisaster support leads to fewer hurricane-related stressors, which in turn, promotes positive postdisaster psychological outcomes.

5. Limitations

This study had several limitations. First, the external validity of the study was limited both by the specific disaster context of Hurricane Katrina and characteristics of the sample. The results might not generalize to survivors of other hurricanes involving different levels of damage, destruction and national attention. Moreover, our results might not be generalizable to other types of disasters such as earthquakes and tsunamis. These disasters, unlike hurricanes, are less predictable and therefore, are not typically preceded by evacuation warnings and instructions. Furthermore, our sample of low-income, African American mothers was not representative of the New Orleans population and therefore, the findings may not be applicable to the general population. Also, given that the participants were all initially enrolled in community college, it is unlikely this sample was representative of all low-income African American mothers in New Orleans. Nonetheless, the demographic characteristics of our sample are of great interest given that more severe postdisaster mental health consequences have been previously associated with this subsample (Norris et al., 2002; Elliott and Pais, 2006).

Second, the measure of perceived social support did not differentiate between emotional, instrumental and tangible support, and we did not collect data on actual support received during the pre- and postdisaster periods. However, previous research has shown that perceived social support is a stronger predictor of mental health outcomes than received support (Kaniasty and Norris, 2009). It should also be noted that our measure of perceived social support only included items from four of the six original subscales. Nonetheless, future studies should include a more comprehensive measure of perceived social support. Third, the instrumentation used to measure psychopathology was limited to PTS and GPD. We did not explore relationships between perceived social support and other psychological symptoms, including generalized anxiety and substance use, that have shown to be elevated in postdisaster contexts (Norris et al., 2002). Our focus on GPD and PTS is consistent with other studies of Hurricane Katrina survivors (Galea et al., 2008; Kessler et al., 2006; Sastry and VanLandingham, 2009).

Fourth, we did not collect detailed information on the frequency and severity of each hurricane-related stressor, nor did we include other indicators of hurricane exposure, such as prolonged displacement and unemployment. As such, we were unable to explore whether the mediational pathway applies to a broader range of hurricane-related exposures or whether the pathway was mediated through a particular stressor. Even so, using a checklist inventory of hurricane-related stressors is consistent with previous research (Chan and Rhodes, 2014; Galea et al., 2008; Tracy et al., 2011).

Despite these limitations, this study provides evidence that higher levels of postdisaster perceived social support continued to be associated with lower levels of GPD four years after a major natural disaster. Additionally, the mediational pathway from pre-disaster perceived social support to postdisaster psychological functioning applies to both GPD and PTS at one- and four-year postdisaster. These results show that predisaster social support has a broad and long-term influence on postdisaster mental health outcomes, although its influence is not always direct. To help attenuate the detrimental impact of natural disasters, practitioners and policymakers should seek ways to solidify social support in the community—both before and after a disaster.

Author note

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