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Posttraumatic stress disorder, depression, and perceived needs for psychological care in older persons affected by Hurricane Ike

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Abstract

Objective—To examine the prevalence and correlates of disaster-related posttraumatic stress disorder (PTSD), depression, and needs for psychological care in older persons affected by Hurricane Ike.

Method—A total of 193 adults age 60 or older who resided in the Galveston Bay area were interviewed 2–5 months following Hurricane Ike. Pre-, peri-, and post-disaster variables hypothesized to be related to PTSD and depressive symptoms, and perceived needs for psychological care were assessed.

Results—Weighted prevalences of past-month Ike-related PTSD and depression were 7.6% and 8.6%, respectively. Risk factors for Ike-related PTSD symptoms were predominantly peri-disaster in nature, with greater hurricane exposure, and peri-event dissociative and autonomic activation symptoms associated positively with these symptoms. Risk factors for depressive symptoms were predominantly pre-disaster in nature, with being married/living with partner associated negatively, and prior disaster exposure and pre-disaster PTSD or depression associated positively with these symptoms. 27.2% of the sample endorsed at least one of the perceived needs for psychological care assessed. A history of PTSD or depression, greater peri-event autonomic activation, and Ike-related PTSD and depressive symptoms were associated with greater need for psychological care.

Limitations—This study is limited by its cross-sectional design and employment of psychiatric screening instruments.

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Contributors

Drs. Galea, Southwick, and Norris designed the study and wrote the protocol. Drs. Pietrzak, Galea, and Norris managed the literature searches and wrote the manuscript. Dr. Pietrzak undertook the statistical analysis. All authors contributed to and have approved the final version of the manuscript.

Conflict of Interest

The authors do not have any conflicts of interest.

Conclusions—A substantial proportion of older adults may have PTSD and depression, as well as perceived needs for psychological care, after a disaster. Assessment of disaster exposures, and peri-event dissociative and autonomic symptoms may help identify older adults at risk for disaster-related psychopathology. Older adults with a history of PTSD or depression, and greater peri-event autonomic activation and PTSD symptoms may be more likely to have needs for psychological care.

Keywords

disaster; posttraumatic stress disorder; depression; functioning; older adults; mental healthcare needs

1. INTRODUCTION

Older age is generally associated with lower risk for psychopathology following exposure to disasters (Acierno et al., 2006; Kato et al., 1996; Norris et al., 2002b; Norris et al., 2002c; Phifer, 1990; Thompson et al., 1993), although some studies have documented comparable (e.g., Goenjian et al., 1994; Ollendick and Hoffman, 1982) or increased risk (Kohn et al., 2005; Norris et al., 2002c; Ticehurst et al., 1996). Understanding the prevalence and determinants of post-disaster psychopathology in older persons is important for several reasons. First, older persons may have physical limitations, diminished sensory and cognitive capacities, or financial difficulties that may affect their preparation for and adaptability to disaster (Aldrich and Benson, 2008; Dyer et al., 2008; Fernandez et al., 2002). Second, older individuals have been found to experience greater exposure to danger during disasters, be less likely to receive warnings, and endure greater financial losses (Acierno et al., 2006; Aldrich and Benson, 2008; Sakauye et al., 2009; Thompson et al., 1993). Third, there may be unique risk factors for psychopathology in disaster-affected older adults (Acierno et al., 2006; Phifer and Norris, 1989), as certain factors associated with aging, such as the presence of a chronic medical or psychiatric condition, as well as the lifetime accumulation of trauma and stress, may increase vulnerability to disaster-related psychopathology and dysfunction (Acierno et al., 2006; Fernandez et al., 2002; Sakauye et al., 2009). Fourth, while older adults may be less likely to seek mental healthcare services in general (Klap et al., 2003), they may have increased needs for such services in the aftermath of a disaster (Dyer et al., 2008; Koenig, 2007; Sakauye et al., 2009).

Posttraumatic stress disorder (PTSD) and depression are among the most prevalent and commonly studied psychological sequelae of disasters (Galea et al., 2005; Norris et al., 2002b). Risk factors for these disorders may be divided into three categories based on their temporal relation to a disaster (Freedy et al., 1994)—pre-disaster variables that preceded the disaster (e.g., female gender, ethnic minority status, and psychiatric history; Norris et al., 2002a; Norris et al., 2002b), peri-disaster variables that occurred around the time of the disaster (e.g., greater traumatic exposure; peri-disaster autonomic activation and dissociation; Bovin and Marx, 2011; Ozer et al., 2003; Shalev et al., 1998), and post-disaster variables that may foster or hinder recovery (e.g., post-disaster social support; Galea et al., 2005; Gapen et al., 2011; Gary et al., 2007; Norris et al., 2002b; Yoon, 2009). Prior traumatic and stressful life events may also increase vulnerability to disaster-related PTSD and depressive symptoms (Acierno et al., 2006; Miguel-Tobal et al., 2006; Person et al., 2006), while prior exposure to disasters may help “inoculate” against these symptoms, as familiarity or experience with a disaster may help one cope with a similar event in the future (Knight et al., 2000; Norris and Murrell, 1988). Taken together, these findings indicate that a broad range of pre-, peri-, and post-disaster factors may be related to disaster-related PTSD and depressive symptoms in disaster-affected individuals.

Several pre-, peri-, and post-disaster variables have been found to be associated with PTSD and depression in older adults. For example, a study of older adults affected by floods in Kentucky found that peri-disaster personal losses were associated with short-term increases in depression symptoms, whereas the level of community destruction was associated with the persistence of these symptoms (Phifer and Norris, 1989). More recently, a study of older adults affected by the 2004 Florida hurricanes found that pre-disaster variables such as prior exposure to trauma, health status, and lower income; peri-disaster variables such as number of days displaced; and post-disaster variables such as low social support, were associated with both PTSD and depressive symptoms, while higher income was associated with lower PTSD symptoms (Acierno et al., 2006). These results suggest that economic factors, as well as level of community destruction and trauma and psychiatric history, may be closely tied to deleterious psychological outcomes in this population.

In the aftermath of a disaster, survivors must begin to process what happened to them and often seek explanations for why the disaster occurred (Koenig, 2007). During this time, they may often attempt to ascribe “meaning” to the disaster and reconstruct their world view. If unsuccessful, they may be at increased risk for developing longer-term psychological difficulties and may require mental health services. While older adults may be less likely to seek mental healthcare services in general (Klap et al., 2003), they may have increased needs for services such as psychotherapy and/or psychoeducation in the aftermath of a disaster (Dyer et al., 2008; Koenig, 2007; Sakauye et al., 2009). Characterization of some of the types and determinants of needs for psychological care may help identify older individuals who may be in need of such care after a disaster.

Hurricane Ike was the third costliest hurricane to ever make landfall in the United States, accounting for \$29.6 billion in damages. It also caused 195 deaths, and prompted the largest search-and-rescue operation in U.S. history and largest evacuation of Texans in state history (Berg, 2009). In an earlier study, our research team found that two to five months after Hurricane Ike, older age was associated with increased psychological symptoms and dysfunction in a representative sample of 658 adults affected by this disaster (Norris et al., 2010). The purpose of the present study was to expand on this preliminary finding to examine how pre-, peri-, and post-disaster risk factors are related to Ike-related PTSD and depressive symptoms and perceived need for psychological care in older adult survivors of Hurricane Ike. Given some evidence for increased vulnerability of older persons to the consequences of disasters (Acierno et al., 2006; Phifer, 1990; Phifer et al., 1988; Phifer and Norris, 1989; Sakauye et al., 2009), characterization of a broader range of pre-, peri-, and post-disaster characteristics than has been considered previously may help identify targets for prevention and treatment that are specific to this population.

2. METHODS

2.1. Sample

A total of 658 adults age 18 or older who had been living in Galveston County or Chambers County, Texas for at least one month before September 13, 2008, when Hurricane Ike struck participated in this study. They were interviewed two to five months following Hurricane Ike. Details regarding sampling and recruitment procedures are available elsewhere (Norris et al., 2010). Briefly, disproportionate stratified cluster sampling was employed to acquire samples in areas that experienced more damage from Hurricane Ike and that were more likely to be exposed to hurricane-related traumas. The cooperation rate for the full sample was 83%. Interviews were conducted by experienced interviewers at the University of Michigan Institute for Social Research using a computer-assisted interview system. All interviews took place between November 7, 2008 and March 24, 2009 and lasted an average of 70 minutes

A total of 193 respondents (29.3% of full sample) were 60 or older at the time of the interview and are the focus of this report. If a potential respondent had cognitive issues or other medical concerns such as a serious illness or hearing impairment that limited their ability to complete the interview, the interview was suspended and coded a non-interview; of respondents age 60 or older, 5 cases were coded as non-interviews. Data were weighted to correct for oversampling and non-response.

2.2. Assessments

Pre-disaster risk factors—Demographic characteristics, including race/ethnicity, marital status, educational attainment, and household income were assessed. A count of 12 stressful life events that had occurred in respondents' lifetimes prior to the disaster was obtained (e.g., divorce or break-up, serious financial problems; (Boardman et al., 2001). Pre-disaster traumatic life events were assessed by asking respondents about their exposure to 10 *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)* Criterion A-qualifying traumas (e.g., serious accident, sudden unexpected death of someone close (Breslau et al., 1998).

Peri-disaster risk factors—*Hurricane Ike exposures* were assessed with questions that asked about respondents' experiences during and after Hurricane Ike. These experiences were grouped into 9 categories: (1) threat to safety of self or family/friends; (2) injury or health problem to self or household member; (3) family member or close friend injured or killed; (4) saw dead bodies during or after Hurricane Ike; (5) damage to three or more types of property (e.g., residence, furnishings, cars/vehicles); (6) financial loss (i.e., lost income as a result of Hurricane Ike); (7) displacement from home > 10 days; (8) lacking two or more necessities for > 1 week (e.g., shelter, electricity, food/water, transportation); and (9) high level of area disruption or damage (sum of ratings of damage and disruption to area schools, churches, streets/highways in the top third for the full sample); Cronbach's α for summary hurricane exposure measures=.80. A count of these nine exposures constitutes a summary measure of Hurricane Ike exposure. *Peri-event autonomic activation* was assessed using the four-item "STRS" scale (Bracha et al., 2004), which assesses self-reported severity of shortness of breath; trembling, shaking, or buckling knees; racing or pounding heart, and/or sweaty palms or other sweating at the time of Hurricane Ike and in the first few hours afterward (Cronbach's α =.85). *Peri-event dissociative symptoms* were measured using a modified version of the Peritraumatic Dissociative Experiences Questionnaire (PDEQ; Marmar et al., 1997), which assesses the extent to which a respondent experienced eight different dissociative symptoms (e.g., feeling disconnected from one's body, blanking out) during or immediately after Hurricane Ike (Cronbach's α =.92).

Post-disaster risk factors—*Post-disaster collective efficacy*, which is defined as mutual trust among neighbors and willingness of neighbors to intervene on behalf of the common good (Sampson et al., 1997), was assessed using a scale that assesses perceptions of social cohesion (sample item: "This is a close-knit or unified neighborhood") and informal social control (sample item: "If some children were spray-painting graffiti on a local building, how likely is it that your neighbors would do something about it?") since Hurricane Ike. The mean of items served as the measure of interest (Cronbach's α =.86); higher scores indicate higher levels of collective efficacy. In the original study that described this measure (Sampson et al., 1997), higher collective efficacy was associated with greater number of friends and relatives living in one's neighborhood (r =.49, p < .01), participation in one's local organizations (e.g., local religious organizations; r =.46, p < .01), and number of available neighborhood services (e.g., a crime prevention program; r =.21, p < .01).

Posttraumatic stress disorder—Respondents reporting at least one lifetime DSM-IV Criterion A-qualifying traumatic event were asked to select their worst event and were queried about PTSD symptoms related to this event using the PTSD Checklist-Specific Stressor Version (PCL-S; (Weathers et al., 1993), a 17-item self-report instrument that assesses DSM-IV symptoms of PTSD. The PCL-S was modified to include additional questions about symptom duration and related dysfunction. A diagnosis of probable lifetime PTSD required endorsement of DSM-IV criteria for PTSD (i.e., endorsement of “moderate” or greater levels of at least 1 intrusion symptom [Criterion B], 3 avoidance/ numbing symptoms [Criterion C], and 2 arousal [Criterion D] symptoms, as well as symptom duration of at least one month [Criterion E] and distress or dysfunction [Criterion F]). *Hurricane Ike-related PTSD symptoms* experienced in the past month were also assessed using the modified PCL-S (Weathers et al., 1993); the total PCL score ranges from 17–85, with a Cronbach’s α of 0.91 in this sample.

Depressive symptoms—Lifetime, pre-Ike depressive symptoms were assessed using the Patient Health Questionnaire-9 (PHQ-9; (Kroenke et al., 2001), which assesses DSM-IV depressive symptoms on a scale from 0 to 27; a score ≥ 10 is indicative of probable major depression (Cronbach’s $\alpha = .86$). *Depressive symptoms* in the past month were also assessed using the PHQ-9 and symptom severity was used as the outcome measure; Cronbach’s $\alpha = .83$.

Perceived needs for psychological care—Perceived needs for psychological care following Hurricane Ike were assessed using four items from a version of the Perceived Need for Care Questionnaire (PNCQ; (Meadows et al., 2000) modified for the disaster context (sample item: “In the past two months, since Hurricane Ike, did you ever feel a need for information about common stress reactions or about services available to help with them?”). Three of these items assessed needs for psychotherapy; and one assessed needs for information about stress reactions (see Table 1). In the initial validation study of the PNCQ, inter-rater reliabilities of any perceived need was 0.62, and exceeded 0.60 for the majority of specific needs; examination of construct validity using a multi-trait, multi-method approach supported the validity of the PNCQ in assessing perceived needs for care (Meadows et al., 2000).

2.3. Data Analysis

Bivariate correlations were examined to evaluate associations between pre-, peri-, and post-disaster variables and Ike-related PTSD and depression symptoms, and perceived psychological needs; Pearson correlations were computed to examine associations between continuous variables; Spearman correlations were computed to examine associations that included a categorical variable. Hierarchical linear regression analyses were then conducted to examine pre-, peri-, and post-disaster variables that were independently associated with Ike-related PTSD symptoms and depressive symptoms. A hierarchical logistic regression analysis was conducted to examine variables associated with any perceived need for psychological care, which was analyzed as a categorical variable (0=no perceived need; 1=one or more perceived needs). Independent variables significantly associated with outcome variables in bivariate analyses at the $p < .05$ level were entered into these regression analyses, with pre-, peri-, and post-disaster variables entered in Steps 1, 2, and 3, respectively. If the summary Hurricane Ike exposure measure was associated with any of the outcome measures, a post-hoc regression analysis was conducted to examine which exposures were associated with the outcome; α was set to .01 in this analysis to reduce the likelihood of making a Type I error.

3. RESULTS

3.1. Descriptive statistics

Descriptive statistics for all study variables are shown in Table 1. On average, respondents had approximately 2 significant Hurricane Ike exposures, the most common of which were experiencing life threat to self or other, being displaced from home ≥ 10 days, and incurring a financial loss because of Ike. Weighted prevalences of past-month Ike-related PTSD and depression were 7.6% and 8.6%, respectively. Over one quarter (27.2%) of the sample endorsed at least one of the perceived needs for psychological care assessed, the most common of which were needing to talk through their problems; needing to change their thoughts or feelings; and needing information about stress reactions.

3.2. Bivariate analyses

Bivariate correlation analyses (data not shown, available from corresponding author) revealed large magnitude correlations ($r^2 \geq .37$) between Ike-related PTSD symptoms and Hurricane Ike exposure (i.e., injury or health problem, damage to 3 or more types of property, financial loss, and high level of community damage), and peri-event autonomic activation and dissociative symptoms. Current depressive symptoms were highly correlated with pre-existing PTSD or depression, Hurricane Ike exposure (i.e., injury or health problem, seeing dead bodies, damage to 3 or more types of property, financial loss, and lacking 2 or more resources for > 1 week), peri-event autonomic activation and dissociative symptoms, informal social control, and Ike-related PTSD symptoms. Finally, any perceived need for psychological care was correlated with pre-existing PTSD or depression, Hurricane Ike exposure (i.e., injury or health problem, seeing dead bodies, and financial loss), peri-event autonomic activation and dissociative symptoms, and Ike-related PTSD and depressive symptoms. The three outcome variables were also highly correlated with each other.

3.3. Hierarchical regression analyses

As shown in Table 2, prior disaster exposure was associated negatively with Ike-related PTSD symptoms, while greater peri-event dissociative symptoms, hurricane exposure, and peri-event autonomic activation were associated positively with Ike-related PTSD symptoms. A post-hoc analysis that examined specific Hurricane Ike exposures associated with Ike-related PTSD symptoms revealed that exposure to a high level of community damage and disruption ($\beta = .37$, $t = 6.15$, $p < .001$) and experiencing a physical injury or health problem because of Ike ($\beta = .27$, $t = 3.48$, $p = .001$) were associated with these symptoms; financial loss was related marginally to Ike-related PTSD symptoms ($\beta = .14$, $t = 2.05$, $p = .041$), but the other Ike-related exposures were not significant (all p 's $> .15$).

Pre-disaster variables associated with depressive symptoms included being married/living with partner, which was negatively associated with depressive symptoms, and pre-existing PTSD or depression, which was associated positively with these symptoms. Greater pre-disaster hurricane exposure was associated positively with depressive symptoms. A post-hoc analysis that examined specific Hurricane Ike exposures associated with depressive symptoms revealed that seeing dead bodies during or after Ike ($\beta = .43$, $t = 6.29$, $p < .001$) and experiencing a physical injury or health problem because of Ike ($\beta = .24$, $t = 3.38$, $p = .001$) were associated with these symptoms; financial loss because of Ike was associated marginally with these symptoms ($\beta = .15$, $t = 2.37$, $p = .019$), but none of the other exposures were significant (all p 's $> .10$).

A hierarchical logistic regression analysis revealed that pre-existing PTSD or depression, and peri-event autonomic activation and Ike-related PTSD symptoms were related independently to any perceived need for psychological care.

4. DISCUSSION

This study examined the prevalence and correlates of Ike-related PTSD and depressive symptoms, and perceived needs for psychological care in a representative sample of older adults directly affected by Hurricane Ike. The prevalences of disaster-related PTSD and depression—7.6% and 8.6%, respectively—were higher than the 1.1% and 3.3% prevalences of these disorders observed in a study of older adults affected by the 2004 Florida hurricanes (Acierno et al., 2007), but lower than those observed in a study of older adults affected by Hurricane Mitch, which found 13.6% and 18.8% prevalences of these disorders, respectively (Kohn et al., 2005). A likely explanation for the intermediate prevalences of disaster-related PTSD and depression observed in the current study is that this sample was assessed sooner and was more homogeneously affected by Hurricane Ike than the sample exposed to the 2004 Florida hurricanes; further, the magnitude of Hurricane Ike, a Category 2 storm, was lower than that of Hurricane Mitch, a Category 5 storm. Of note, the prevalences of PTSD and depression observed in the current sample are higher than the 12-month prevalence of these disorders in the general population of U.S. adults aged 60 or older—1.0% and 2.9%, respectively (National Comorbidity Survey-Replication, 2011; Byers et al., 2010), thereby underscoring the public health significance of these disorders in older persons affected by Hurricane Ike. Pre-disaster determinants of PTSD and depressive symptoms in the current sample included marital status, prior disaster exposure, and previous PTSD or depression, whereas peri-disaster predictors included exposure to Hurricane Ike, as well as autonomic activation and dissociative reactions at the time of the hurricane.

With the exception of prior disaster exposures, pre-disaster variables were not strongly associated with Ike-related PTSD. Although pre-existing PTSD or depression was associated with greater severity of Ike-related PTSD symptoms ($M=33.5$, $SD=13.5$ vs. 22.6 , $SD=9.5$, $t(190)=5.71$, $p<.001$), it was not significant in the final multivariate analysis. This finding suggests that, when considered within the context of other pre-, peri-, and post-disaster risk factors, a history of PTSD or depression does not appear to be associated with disaster-related PTSD symptoms in this sample of older adults. By contrast, the majority of risk factors for current depressive symptoms in this sample pre-existed Hurricane Ike, and included a lifetime history of PTSD or depression, prior disaster exposure, and not being married/living with partner. The finding that pre-existing PTSD or depression was associated with depressive symptoms is consistent with prior studies (Norris et al., 2002b), and suggests that either depressive symptoms were chronic in nature or that older adults with a lifetime history of these conditions may be more vulnerable to developing depressive symptoms in the aftermath of a disaster. Being married/living with a partner was protective against depressive symptoms. Prior research has similarly observed this effect, though some studies have found that being married may actually increase disaster-related distress, as marital stress may intensify after a disaster (Norris et al., 2002b).

Prior disaster exposure was associated negatively with Ike-related PTSD symptoms, but positively with depressive symptoms. These findings provide some support for the “inoculation hypothesis,” which suggests that being familiar or experienced with a particular traumatic event may help one cope with a similar event in the future (Knight et al., 2000; Norris and Murrell, 1988), at least with respect to disaster-related PTSD symptoms. However, prior disaster exposure seems to increase vulnerability to depressive symptoms in the aftermath of a newly experienced disaster. The magnitudes of these effects were modest,

and more research is needed to determine how to utilize older adults with disaster experience as a resource in disaster recovery efforts while mitigating their own negative reactions to the event.

Hurricane Ike exposures linked to Ike-related PTSD symptoms included experiencing a high level of community damage, enduring a physical injury or health problem, and witnessing death. Prior research in disaster-exposed samples has similarly observed that disaster exposures that are associated with life threat, injury, and community disruption are related to increased severity of PTSD symptoms (Kohn et al., 2005; Norris et al., 2002b; Phifer and Norris, 1989; Thompson et al., 1993). Seeing dead bodies during or after Ike and experiencing a physical injury or health problem because of Ike were also linked to depressive symptoms. This finding accords with evidence suggesting that witnessing death and experiencing an injury or health problem are related to increased depressive symptoms in disaster-affected individuals (Kar et al., 2004; Norris et al., 2002b). Finally, as observed in a recent study of older adults affected by the 2004 Florida hurricanes, disaster-related financial loss was also marginally related to depressive symptoms in the current sample of older adults (Acierno et al., 2006).

Greater peri-event dissociative and autonomic symptoms were associated with increased Ike-related PTSD symptoms. This finding is consistent with research demonstrating that peritraumatic dissociative symptoms and autonomic reactivity are associated with heightened risk for PTSD (Bovin and Marx, 2011; Ozer et al., 2003; Shalev et al., 1998). Peritraumatic dissociation, which is characterized by perceptual alterations, emotional detachment, and reduced awareness of one's surroundings (Marmar et al., 1997), is among the strongest risk factors for trauma-related distress (Ozer et al., 2003). Preclinical and clinical data suggest that autonomic activation, which is associated with increased adrenergic activation, may lead to an "overconsolidation" of memory for a trauma, which may in turn increase PTSD symptoms (O'Donnell et al., 2004). The large magnitude association between peri-event dissociative symptoms and Ike-related PTSD symptoms underscores the importance of assessing these symptoms in older adults affected by disaster, as it may help identify individuals who may be most at-risk for PTSD. The brevity of the STRS scale (i.e., 4 items) and PDEQ (i.e., 8 items) make these instruments suitable for rapid screening and may complement triaging tools to assess needs of older adults affected by disasters (Dyer et al., 2008). Additional research is needed to evaluate whether interventions to reduce adrenergic activation in the acute phase of trauma (Vaiva et al., 2003) may help mitigate risk for disaster-related PTSD symptoms in older adults.

Nearly a third of this sample of older adults reported at least one of the perceived needs for psychological care assessed, the most common of which were needs for psychotherapy (e.g., to talk through problems, and needing to change thoughts or feelings). This finding suggests that, two to five months following a disaster, a considerable proportion of older adults may want to process what happened to them, possibly in attempt to cope with their psychological symptoms, ascribe "meaning" to the disaster, or reconstruct their world view (Koenig, 2007). Results of a multivariate analysis suggested that disaster-affected older adults with a pre-existing history of PTSD or depression, as well as greater peri-disaster emotional reactivity and disaster-related PTSD symptoms, may be in particular need of psychological assistance after a major natural disaster. This finding underscores the importance of targeting psychological first aid (e.g., ensuring safety, offering support and reassurance, providing information) and mental health interventions (Sakaue et al., 2009) toward older adults with these characteristics.

Methodological limitations of this study must be noted. First, generalizability of these results is limited to older persons in the "young old" age range. Second, screening

instruments were used to assess psychiatric symptoms, so it remains to be determined whether results would be similar when diagnostic instruments are employed. Third, the assessment of lifetime history of traumatic and stressful life events was somewhat limited in that it assessed a relatively small number of events; additional research is needed to determine whether a more comprehensive assessment of these events would yield different patterns of associations with psychopathological outcomes in older adults affected by disaster. Fourth, details regarding respondents' medical histories, ambulatory/disability status, and cognitive functioning were not systematically assessed; additional research is needed to examine the extent to which these variables may relate to post-disaster psychological symptoms and needs for psychological care in older persons. Finally, a relatively large number of independent variables were entered into the regression analyses, which may have increased the likelihood of Type I error. Thus, independent variables that are significantly associated with PTSD and depressive symptoms, and perceived psychological needs at the $p < .01$ level may be more likely to have clinical significance than variables associated with these outcomes at the $p < .05$ level.

Despite these limitations, notable strengths of this study include a rigorous sampling strategy; ability to obtain data regarding the psychological consequences of disaster exposure within two to five months of a major natural disaster; and assessment of a broad range of pre-, peri-, and post-disaster risk factors for PTSD, depression, and psychological needs (Norris et al., 2010). Future research should examine the long-term course of disaster-related psychological symptoms in older adults, and evaluate the effectiveness of prevention and treatment efforts that target the specific needs of this population.

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Table 1

Descriptive statistics for all study variables in the older adult sample

	n (weighted %)	Weighted Mean (SD)
<i>Pre-disaster variables</i>		
Age (years)		69.2 (7.6)
60–69	116 (59.9%)	
70–79	50 (26.0%)	
80–100	27 (14.1%)	
Male sex	103 (53.3%)	
Race/ethnicity		
White non-Hispanic	145 (76.7%)	
Black non-Hispanic	25 (13.4%)	
Hispanic	12 (6.1%)	
Other non-Hispanic	7 (3.8%)	
Education		
Less than high school	50 (26.8%)	
High school graduate	58 (30.8%)	
Some college or higher	80 (42.4%)	
Marital status		
Married/living with partner	121 (62.7%)	
Divorced/separated/widowed	52 (26.9%)	
Never married	4 (2.4%)	
Household income year before Ike		
<\$40,000	116 (64.3%)	
≥\$40,000	65 (35.7%)	
Retired	142 (73.5%)	
Number of traumas in lifetime before Ike		3.9 (2.7)
Number of stressors in lifetime before Ike		2.6 (1.8)
Experienced disaster before Ike	114 (59.1%)	
Serious illness or injury before Ike	89 (46.1%)	
PTSD or depression prior to Ike	37 (19.3%)	
<i>Peri-disaster variables</i>		
Summary exposure index		1.9 (2.1)
Life threat to self or other	74 (38.3%)	
Displaced from home ≥ 10 days	66 (34.1%)	
Financial loss	53 (27.6%)	
Damage to 3 or more types of property	53 (27.4%)	
High level of community damage	46 (23.9%)	
Lacking 2+ resources for ≥ 1 week	45 (23.4%)	
Injury or health problem	39 (20.4%)	
Saw dead bodies during or after Ike	13 (6.6%)	
Family member or friend killed or injured	5 (2.4%)	

	n (weighted %)	Weighted Mean (SD)
Peri-event autonomic activation		1.7 (2.8)
Peri-event dissociative symptoms		10.6 (5.1)
<i>Post-disaster variables</i>		
Collective efficacy		3.9 (0.9)
Social cohesion		4.0 (0.9)
Informal social control		3.8 (1.1)
<i>Outcome variables</i>		
Ike-related PTSD symptoms (PCL-S score)		24.6 (11.0)
Depressive symptoms (PHQ-9 score)		2.2 (4.4)
Any perceived need for psychological care	52 (27.2%)	
To talk through your problems or reactions	42 (22.5%)	
To change your thoughts, feelings, or behaviors	34 (18.2%)	
Information about common stress reactions or services to help with them	26 (14.0%)	
To discuss causes of your distress that may stem from your past	22 (11.7%)	

Note. n=unweighted number of respondents; SD=standard deviation; PTSD=posttraumatic stress disorder; PCL-S=PTSD Checklist-Specific Stressor Version; PHQ-9=Patient Health Questionnaire-9

Results of multiple regression analyses predicting Ike-related PTSD symptoms, depressive symptoms, and perceived need for psychological care among adults aged 60 years or older

Table 2

	F	p	R ²	β	t	p
Ike-related PTSD symptoms	11.60	<.001	.25			
<i>Pre-disaster variables</i>						
Nonwhite race/ethnicity				.02	.49	.62
High school education				-.09	1.78	.077
Experienced disaster before Ike*				-.14	3.17	.002
Number of traumas in lifetime before Ike				-.07	1.24	.21
Number of stressors in lifetime before Ike				.09	1.39	.17
Pre-existing PTSD or depression				-.02	.45	.65
<i>Post-disaster variables</i>	42.12	<.001	.66			
Summary hurricane exposure index***				.23	4.35	<.001
Peri-event autonomic activation**				.20	2.97	.003
Peri-event dissociative symptoms***				.53	7.85	<.001
<i>Post-disaster variables</i>	37.86	<.001	.66			
Collective efficacy				-.03	.72	.47
Depressive symptoms						
<i>Pre-disaster variables</i>	40.91	<.001	.52			
Married/living with partner***				-.20	3.84	<.001
Nonwhite race/ethnicity				-.07	1.19	.23
Experienced disaster before Ike**				.18	3.42	.001
Number of traumas in lifetime before Ike				-.10	1.50	.13
Pre-existing PTSD or depression***				.56	9.75	<.001
<i>Post-disaster variables</i>	28.51	<.001	.54			
Summary hurricane exposure index*				.14	2.41	.017
Peri-event autonomic activation				.10	1.71	.089
Peri-event dissociative symptoms				-.02	.38	.70
<i>Post-disaster variables</i>	25.34	<.001	.54			

	F	P	R ²	β	t	p
Collective efficacy				-.05	.87	.39
Any perceived need for psychological care	Nagelkerke	Wald	p	OR	95% CI	
	R ² =.76					
<i>Pre-disaster variables</i>						
Age	1.77	.18	.93		.84-1.03	
Female sex	1.96	.16	2.47		.70-8.78	
Nonwhite race/ethnicity	2.46	.12	.26		.05-1.40	
Number of stressors in lifetime before Ike	2.49	.11	1.26		.94-1.71	
Number of traumas in lifetime before Ike	.01	.91	.98		.63-1.52	
Pre-existing PTSD or depression *	4.18	.041	5.71		1.07-30.37	
<i>Peri-disaster variables</i>						
Summary exposure index	.03	.87	1.03		.70-1.52	
Peri-event autonomic activation **	7.92	.005	1.70		1.17-2.45	
Peri-event dissociative symptoms	2.08	.15	.80		.60-1.08	
<i>Post-disaster variables</i>						
Ike-related PTSD symptoms *	5.77	.016	1.13		1.02-1.25	
Depressive symptoms	.49	.48	1.06		.90-1.24	
Informal social control	.38	.54	1.25		.61-2.58	

Note:

* p<.05;

** p<.01,

*** p<.001.

PTSD=posttraumatic stress disorder. OR=odds ratio.