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Post-Typhoon Prevalence of Post-traumatic Stress Disorder, Major Depressive Disorder, Panic Disorder and Generalized Anxiety Disorder in a Vietnamese Sample

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Abstract

In 2006, typhoon Xangsane disrupted a multi-agency health needs study of 4,982 individuals in Vietnam. Following this disaster, 798 of the original participants were re-interviewed to determine

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prevalence and risk-factors associated with post-traumatic stress disorder (PTSD), major depressive disorder (MDD), panic disorder (PD), and generalized anxiety disorder (GAD) according to the DSM-IV (APA, 1994). Post-typhoon prevalences were: PTSD 2.6%; MDD 5.9%; PD 9.3%; GAD 2.2%. Of those meeting criteria for a disorder, 70% reported only one disorder, 15% had two, 14% had three, and 1% met criteria for all four disorders. Risk factors for post-typhoon psychopathology differed among disorders, but generally were related to high typhoon exposure, prior trauma exposure, and in contrast to Western populations, higher age, but not gender.

Keywords

DISASTER; TYPHOON; PTSD; DEPRESSION; PANIC; VIETNAM

Hurricanes striking the coast of the United States significantly affected both physical infrastructure and health in the past five years, and questions have been raised regarding the mental health effects of such events (Acierno, Ruggiero, Galea et al., 2007; Acierno, Ruggiero, Resnick et al., 2006; Galea, Brewin, Jones, et al., 2007; Kahn, Mackert & Johnson, 2007; Rhoads, Pearman, Rick, 2007; Weems, Watts, Marsee, 2007; Weisler, Barbee & Townsend, 2006). As expected, hurricane researchers replicated previous findings of increased prevalence of negative mental health outcomes secondary to other natural disasters (Briere & Elliot, 2000; Galea et al., 2007; Norris, 2005; Norris Friedman & Watson, 2002a; Norris, Friedman, Watson et al., 2002b; Sajid, 2007), including posttraumatic stress disorder [PTSD], major depressive disorder [MDD], generalized anxiety disorder [GAD], panic disorder [PD], and substance use disorders. Moreover, specific risk factors for these negative outcomes were identified, including pre-hurricane exposure to potentially traumatic events (PTEs), high fear levels during the hurricane itself, lower age, and low social support (Acierno et al., 2007).

Most post-disaster research has been on Western populations, and relatively little research exists on mental health effects of disasters on diverse populations outside of the United States (Norris et al., 2002b), particularly in lower or middle income countries, with less well developed mental health infrastructures such as that in Vietnam. However, recent efforts by the Vietnamese government to conduct mental health needs analyses, specifically the Da Nang Department of Health and the Khanh Hoa Health Service serendipitously allowed us to begin to address this deficit. During one of these needs analyses, on October 26th, 2006 typhoon Xangsane, equivalent to a Category 4 hurricane, struck Vietnam. Despite an extraordinarily successful evacuation, Xangsane was responsible for at least 72 deaths, hundreds of severe injuries, and at least $629 million in damages in Vietnam (Iglesias, 2006; Chaudhury & Ruysschaert, 2007). The storm destroyed over 300,000 houses, leaving even greater numbers of Vietnamese homeless (Chaudhury & Ruysschaert, 2007).

We hypothesized that the Vietnamese individuals exposed to Xangsane would respond to disaster in a manner similar to that of their US and European counterparts, with elevated risk of negative mental health outcomes associated with lower self-reported health status, and higher typhoon exposure. We also predicted that having a religious affiliation would be a proxy to social support and would thus be protective against negative outcomes. Finally, we predicted that, as with Western populations, older age would be a protective factor.

Methods

In 2006, the Da Nang Department of Health and the Khanh Hoa Health Service, in cooperation with several NGOs (i.e., the Research and Training Centre for Community Development [RTCCD], the Vietnam Veterans of America Foundation [VVAF], and the Atlantic Philanthropies) were conducting a mental health needs assessment of residents in their

respective provinces to attempt to estimate the number of probable mental health cases (no diagnostic interviewing was undertaken). The initial data collection (Wave 1) occurred between August and October of 2006, with typhoon Xangsane striking Da Nang province on October 26th. Participant recruitment and interviewing were halted, and NGO study personnel consulted with the Disaster Research Education and Mentoring Center (DREM), a National Institute of Mental Health-funded research advisory group staffed by faculty from the Medical University of South Carolina and the University of Michigan, to determine how the study design should be modified.

Following two site visits involving DREM advisory suggestions and training, the Vietnamese research team altered their original cross-sectional study design so that 800 participants who had been screened prior to the typhoon were re-assessed following the event, this time with diagnostic data. Wave 2 was conducted between January 8 and January 15, 2007, in 21 of the 28 communes in Da Nang (data were not collected in Khanh Hoa because that province was not affected by the typhoon). Wave 1 and Wave 2 measures were peer reviewed by both Vietnamese experts and consultants in the United States prior to administration, however, due to the short timeframe, no back-translation of the interview was possible.

Selection of Participants

Wave 1 participants were recruited through a four stage cluster sampling strategy. First, 30 communes were randomly selected from each province (the highest structural management of authority in Vietnam, below the government). Second, three hamlets (smaller communities – typically under 1,000 people) were randomly chosen at each selected commune. Third, 30 households were randomly selected at each chosen hamlet, and finally, all household members ages 11 and older were selected for potential study. When Typhoon Xangsane hit Da Nang province, the Wave 1 survey had been implemented in 21 of the selected 30 communes. Of the remaining nine communes, seven inland communes were accessible after the typhoon and were interviewed. Two coastal communes were not accessible after the typhoon and were unable to be interviewed. Therefore, the final sample for Wave 1 included 4,981 adults, ages 18 years or older.

A subsample (*N*=798) of adults residing in Da Nang who participated in Wave 1 were surveyed again following the typhoon for Wave 2. The sub-sample was selected through a three-stage sampling strategy. First, a sample frame was compiled by pooling details of all persons aged 18 and over who were surveyed at Wave 1 and were living in one of the 21 selected communes. Next, 800 persons were randomly selected from the above sample frame using computer random command resulting in the selection of an average of 38 persons at each commune. In addition, a list of 20 substitutes per commune was generated in case the index person was not available. These procedures yielded a total of 798 completed interviews. However, data were missing for one participant, thus the final sample size for Wave 2 was 797.

Interviewers

For Wave 1, Vietnamese lay interviewers from Da Nang and Khanh Hoa received six days of training, which included information regarding the purpose of the study, the research design, and the specific questionnaires, an interview training protocol, and education on depression, anxiety, alcohol abuse, sleep problems, chronic fatigue, and somatic symptoms. During this training, interviewers practiced administering the measures. Interviewers were given one day following training to review the measures prior to administration in the field. Surveys were completed within each household with interviews lasting approximately 2 hours per participant. In order to be considered a member of a household, individuals must have eaten together and lived together for at least six months prior to the date of the interview. Interviewers received ongoing supervision by a designated team leader.

For Wave 2, lay interviewers were joined by eight physician interviewers in order to measure possible differences between the two interviewer classes in terms of diagnostic prevalences. All interviewers and physicians in Wave 2 received the same training as the interviewers in Wave 1. Rates of all DSM-IV diagnoses were not different between interviewer types.

Variables

Selection of factors associated with increased risk of negative mental health outcomes was driven by existing mental health epidemiological studies (Acierno et al., 2007; Freedy, Resnick, Kilpatrick, 1992; Freedy, Saladin, Kilpatrick et al., 1994; Galea, Ahern, Resnick et al., 2002), as well as research on US and European populations in general. We focused on MDD, GAD, PD and PTSD because these disorders are among the most common in the aftermath of disasters and PTEs (Acierno et al., 2007). These investigations indicated that risk and protective factors should include age gender, health status, prior trauma exposure, degree of storm exposure (e.g., damage to one's residence, displacement from one's home, personal or familial injury), and extreme fear during hurricane exposure. Unfortunately, an important protective factor, social support, was not directly studied; however what might be considered a proxy for social support, religious affiliation, was assessed.

Demographic Variables (Wave 1)—Gender was defined as being male or female. Age was used continuously. Religious affiliation was measured dichotomously by a participants' indication that they practiced any of the following religions: Buddism, Christianity, Other Religion.

Self Reporting Questionnaire-20 (Waves 1 and 2)—The SRQ20 is a 20 item self-report measure of mental health (WHO, 1994). Items are marked dichotomously over a 30 day recall period to obtain a maximum score of 20. According to the WHO SRQ20 manual (1994), items do not stand for themselves but are representative of several mental health constructs, and are not intended to be reported separately. Results are recommended to be reported as a dichotomous "case" or "non-case;" however, the contribution of individual items to this measure of "caseness" may be suggestive of the particular category of mental disorder they represent. Based on the recommendations of the literature (e.g., Tuan et al., 2004, Harpham et al., 2003), a cut-off of 7/8 (i.e. 7= probable non case; 8=probable case) has been chosen for this study and has been commonly reported in a range of studies conducted in developing countries and is recommended by the World Health Organization (WHO, 1994). The SRQ20 has been found to be reliable and valid in Vietnamese studies (Giang, 2006), and high internal reliability was found in the present sample (Chronbach's α=.87).

General Health Status (Wave 1)—As used in the previous literature (Acierno et al., 2007; Galea et al., 2007), Item #1 of the World Health Organization, Short Form-36 (SF-36, Version 2) was administered to estimate health status in this sample. Participants are asked to rate the following question, "In general, would you say your health is "Excellent, Very good, Good, Fair, or Poor." These responses were dichotomized into Poor Health (self rating of fair or poor) and Good Health (self rating of excellent, very good, or good).

PTSD (Wave 2)—PTSD since the typhoon was assessed via the National Women's Study PTSD module (NWS-PTSD) (Kilpatrick, Resnick, Saunders & Best, 1989), a widely used measure in population-based epidemiological research originally modified from the Diagnostic Interview Schedule. Research on the NWS-PTSD has provided support for concurrent validity and several forms of reliability (e.g., temporal stability, internal consistency, and diagnostic reliability) (Resnick, Kilpatrcik, Dansky et al., 1993; Kilpatrick, Ruggiero, Acierno et al., 2003). The NWS-PTSD was also validated in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM IV), PTSD Field Trial against a well-established structured

diagnostic interview administered by trained mental health professionals (Structured Clinical Interview for DSM IV) (Spitzer, Williams, Gibbons et al., 1995), where the interrater κ coefficient was 0.85 for the diagnosis of PTSD, and comparisons between the NWS-PTSD module and Structured Clinical Interview for DSM IV yielded a κ coefficient of 0.71 for current and 0.77 for lifetime PTSD (Kilpatrick, Resnick, Freedy et al., 1988). We defined PTSD based on DSM-IV symptom requirements (i.e., 3 avoidance, 1 intrusion, and 2 arousal symptoms), including functional impairment. Among individuals screening into the NWS-PTSD module, Cronbach's α for symptoms assessed with this sample was .86.

MDD (Wave 2)—Major Depressive Disorder [MDD] since the typhoon was measured using structured interview questions modified from the Structured Clinical Interview for DSM-IV (Spitzer et al., 1995) that target MDD criteria using yes/no response formats for each DSM-IV symptom. Following DSM-IV criteria, respondents met criteria for MDD if they had 5 or more depressive symptoms for at least 2 weeks. Support for internal consistency and convergent validity exist for this measure (Kilpatrick et al, 2003). Cronbach's α for this sample for individuals screening into the module was .82.

PD (Wave 2)—PD since the typhoon was measured using a slightly modified version of the Structured Clinical Interview for DSM-IV (Spitzer et al., 1995) using structured interview questions that correspond directly to DSM-IV criteria using yes/no response options. The diagnosis required recurrent panic attacks and at least excessive and poorly controlled worry and concern or behavior change related to future attacks, and the presence or absence of agoraphobia, occurring more days than not for a period of 6 to 9 months ("since the hurricanes.

GAD (Wave 2)—GAD since the typhoon was also measured using a slightly modified version of the Structured Clinical Interview for DSM-IV (Spitzer et al., 1995) structured interview questions that correspond directly to DSM-IV criteria using yes/no response options. The diagnosis required excessive and poorly controlled anxiety and worry occurring more days than not for a period of 6 to 9 months ("since the hurricanes"), as well as 3 of 6 hallmark GAD symptoms, including restlessness, fatigue, concentration problems, irritability, tension, and sleep disturbance. This scale also showed good internal consistency in the current sample among individuals screening into the module (Cronbach's α|=|.85).

Typhoon Exposure (Wave 2)—As reported in our prior research with hurricanes (Acierno et al., 2006; Norris et al., 2002b; Iglesias, 2006) typhoon exposure variables included yes-no responses to the following questions: 1) "Did you evacuate from the place you were living because of the storm?" 2) "Whether you evacualted or not, were you personally present when Typhoon-force winds or major flooding occurred?" 3) "Did the storm damage the place you were living or other personal property?" 4) "Because of the typhoon damage, were you unable to live in your home?" 5) "Whether you evacuated or not, how afraid were you during the typhoon that you might be killed or seriously injured during the storm?" (was dichotomized) 6) "Were you injured during or after the storm?" and 7) "Was any member of your family injured or killed during or after the storm?" High typhoon exposure was defined as having experienced four or more of these indicators (38.6% of sample).

PTE Exposure (Wave 2)—Participants were asked if they had been exposed to 1) a natural disaster (other than the current typhoon), 2) a serious motor vehicle accident, 3) a weapon attack, 4) an attack without a weapon, 5) military combat or a war zone, and 6) sexual exploitation, insultation, physical violence, or deathful endanger. All lifetime events were assessed for Criterion A2, and a dichotomous variables of at least one previous Criterion A PTE versus no previous Criterion A PTE exposures was created.

Statistical Analyses

Means of the SRQ-20 at Wave 1 and 2 were compared via a repeated measures ANOVA. Two-tailed bivariate χ^2 analyses were performed to examine likelihood of diagnosis with respect to pre-typhoon SRQ-20 caseness, health status, gender, experience of prior PTEs and typhoon exposure, and t-tests were conducted to determine if age (used continuously) was different by disorder status. Next, all variables that reached a cutoff of $p < .05$ in bivariate χ^2 or t-test analyses for a particular disorder were examined in logistic regression analyses to determine their relative contribution to risk for each disorder.

Results

Sample

Of the 797 participants for whom both pre and post-typhoon data were available, mean age was 41.6 years (SD = 16.5 years; range = 18 to 96), 84.9% were under 60, and 15.1% were over 60. Considering marital status, 18.4% were single, 69.6% were married, 2.7% were separated or divorced, and 9.2% were widowed. Considering employment status, 3.1% indicated that they were unemployed, 14.8% indicated that they were retired, 5% stated that they were students, 8.8% noted that they worked in the home with their families, and the remainder indicated that they held some sort of work. Regarding prior PTE exposure, 46.5% of the sample reported exposure to at least one Criterion A PTE event (other than the current typhoon). In regard to typhoon exposure, 64.3% reported moderate or extreme fear, 42.8% evacuated, 95.5% were exposed to winds or flooding, 83.3% had property damage, 23.5% had a home that was unlivable, 3.9% were injured because of the storm, and 3.8% had a family member with an injury because of the storm. Overall, post-typhoon prevalence for each disorder was as follows: PTSD 2.6%; MDD 5.9%; PD 9.3%; GAD 2.2%. In terms of comorbidity, the majority of participants who met criteria for a post-typhoon diagnosis (n=100) met criteria for only one disorder (70%), 15% met criteria for two disorders, 14% met criteria for three disorders, and 1% met criteria for all four disorders.

General Mental Health

Comparison of the SRQ-20 total score indicated that post-typhoon SRQ-20 score was significantly higher than pre-typhoon scores ($F(1,794)=11.42$, $p<.01$; pre-typhoon $M=4.29$, $S.D.=4.29$; post-typhoon $M=4.79$; $S.D.=4.62$).

PTSD

Table 1 shows the odds ratios and results of χ^2 analyses in terms of risk for post-typhoon DSM-IV PTSD. In univariate analyses, risk of PTSD was increased for individuals with pre-typhoon SRQ-20 caseness, prior PTEs, and those who experienced high typhoon exposure. T-test results indicated that age did not differ by disorder status ($t(778)=-.770$, $p=.44$). However, when isolating unique effects of variables in logistic regression analyses (Table 2)[1], only prior caseness on the SRQ20 (OR=2.76), and the experience of prior PTEs (OR=5.21) predicted increased risk of post-typhoon PTSD.

MDD

For MDD, a different picture emerged, with relatively greater numbers of risk factors predicting the disorder in both univariate and multivariate analyses. Univariate tests (Table 3), showed that almost every risk factor examined was associated with depression, with the exception of gender and religious affiliation. T-test results indicated that individuals with MDD had a higher

[1]Exploratory logistic regression analyses were conducted for all diagnostic outcomes to examine a possible interaction between age and prior PTE exposure; this interaction term was not significant for any outcome.

average age than did those without MDD ($t(706)=-3.99$, $p<.05$). When shared variance was controlled in logistic regression (Table 2), pre-typhoon SRQ20 caseness (OR=2.20), prior PTEs (OR=3.19), and high typhoon exposure (OR=3.81) were associated with increased depression.

PD

For PD, all variables, with the exception of gender, predicted increased risk in univariate analyses (Table 4). Age also differed by disorder status ($t(716)=-4.60$, $p<.001$). In multivariate regressions (Table 2), poor health (OR=2.26), prior PTEs (OR=3.80), and not being religiously affiliated (OR=.44) were associated with PD.

GAD

Increased risk of GAD in univariate analyses (Table 5) was associated with having pre-typhoon SRQ-20 caseness, poor health status, having a prior PTE history, and being exposed to high typhoon exposure. Age did differ by disorder status ($t(784)=-2.87$, $p<.01$). Logistic regression revealed that only pre-typhoon SRQ20 caseness (OR=3.27) and high typhoon exposure (OR=4.23) independently increased risk of GAD (Table 2).

Any Diagnosis

As shown in Table 6, variables related to increased risk for meeting criteria of any of the four disorders included pre-typhoon SRQ-20 caseness, poor health, prior PTE history, and high typhoon exposure. T-tests indicated that those with a disorder had a higher mean age than did those without a disorder ($t(793)=-4.30$, $p<.001$). In multivariable analyses (Table 2). Having poor health status (OR=2.47), having a prior PTE history (OR=3.13), and having high typhoon exposure (OR=2.35) all contributed independently to afford higher risk for meeting criteria for a disorder post-typhoon.

Discussion

The present investigation would not have been possible without the direction and assistance of the DaNang Ministry of Health and participating NGO's, and adds to the research on prevalence of psychiatric difficulties in non-Western populations, which is still in its infancy. Several key findings from this study emerged. The prevalence of anxiety and mood disorders post-typhoon was low; however, 12.5% of the sample met criteria for at least one post-typhoon diagnosis. Unlike Western populations, gender was not a consistent risk factor, and in direct contrast to findings with Western populations, older age was generally associated with increased, rather than decreased risk of most symptoms (however, when controlling for other variables, age was not a predictor in the final models). No studied risk factor, predicted every disorder; however, pre-typhoon SRQ-20 caseness and high typhoon exposure was predictive of all disorders on a univariate level. Multivariate analyses revealed that prior PTE exposure predicted four out of five diagnostic categories; pre-typhoon SRQ-20 caseness and high typhoon exposure were also good predictors in that they predicted three of the five diagnostic categories. Finally, probable mental health distress, as measured by the SRQ-20, was higher post-typhoon compared to pre-typhoon.

A review of the literature indicates that two existing epidemiological surveys of mental health in the Vietnamese population exist (Tuan, Harpham & Huong, 2004; Giang, 2006); however, these studies did not use diagnostic level assessment indices, and their sample sizes were not as large. Specifically, the studies estimated disorder prevalence with the SRQ-20 rather than structured clinical interview. Our data indicate a comparable level of probable mental distress pre-typhoon as previous studies (Tuan et al., 2004; Giang, 2006). Post-typhoon scores on the SRQ-20 were significantly higher than pre-typhoon scores, indicating increased "mental

distress;" interestingly, although pre-typhoon probable mental health distress predicted PTSD, MDD, and GAD, many other post-typhoon variables also added predictive value, above and beyond pre-existing mental health distress. However, considering post-disaster data, prevalence of mental disorders in Da Nang was low compared to Western population studies (Acierno et al., 2007). In fact, the prevalence of disorders in the present post-disaster study was lower than US general (i.e., not disaster) population estimates found in the National Comorbidity Study (Kessler, Chiu, Demler & Walters, 2005). This is not to say that the effect of the typhoon on emotional functioning was negligible, as many individuals do report that they experienced emotional distress or sub-clinical levels of symptoms. We posit a number of possible explanations for our low prevalence rates. First, the interview measures used may have resulted in under-estimations. Although these measures have shown high validity and reliability in US studies, no initial psychometric studies of the interviews with Vietnamese individuals were conducted because rapid post-disaster implementation of the assessment was necessary (and therefore back translation of measures was not possible). However, our low prevalence of disorders was consistent with studies of Vietnamese immigrants to other countries (e.g., Steel, Silove, Phan, & Bauman, 2002), who used a culturally specific and generic diagnostic measure, finding similar low estimates from each assessment tool. Second, it is also possible that the cultural fit of these more "western" diagnoses does not fit for the Vietnamese culture. When examining the percent of individuals meeting criteria for any one of the disorders, approximately 12.6% of participants met criteria, which is still lower than U.S. estimates, but is higher than individual diagnostic categories. Third, the Vietnamese culture may have protective factors that we did not assess (e.g., family cohesion, connectedness, social support) that may be important buffers to mental health distress in the wake of disasters (see Davis, 2000).

In Western populations, female gender is typically a risk factor for affective and some anxiety disorders (Kessler et al., 2005). In the two existing epidemiologic studies with Vietnamese participants (Tuan et al., 2004; Giang, 2006), gender was also found to confer higher risk for psychiatric disorders. Contrary to these earlier studies, men and women in the present investigation were at similar risk for psychiatric conditions. We hypothesize that this similarity in risk between the genders may be due to the qualities of the Vietnamese gender roles; namely that as traditional head of the household, and primary income earners in both metropolitan and rural regions, men maybe experiencing greater stress associated with maintaining employment in an increasingly developing competitive economy. It may also be that both men and women were willing to reveal their level of distress to interviewers, and this may reflect broader social changes to the Vietnamese culture which may have previously discouraged the discussion of emotions and in which emotional distress was associated with shame or stigma (Harpham & Tuan, 2006). It is also possible that this relationship is due to the war torn history in Vietnam, and the higher likelihood of men to be exposed to war-related PTEs than women.

Also in contrast to findings in Western populations, higher age was not protective, but was consistently associated with increased likelihood of most symptoms, prior to controlling for other variables. This again may be due to older individuals being more likely to have lived through the war and been exposed to that stressor. These key differences highlight the importance of conducting research in Vietnam, as well as other developing countries. Risk factors in these populations need to be identified in order to best inform post-disaster allocation of resources.

Another interesting finding from this study is that each disorder had a unique set of risk factors in the final multivariate models. Prior mental health distress was predictive of PTSD, MDD, and GAD, underscoring the need to target post-disaster services to those with prior mental health problems that may be exacerbated by a disaster. Although the experience of a prior PTE and high typhoon exposure were significant univariate predictors of post-typhoon PTSD, only

prior PTE history remained significant in the final model, with high typhoon exposure being of marginal significance. There are many established risk factors for PTSD in Western populations (e.g., gender, poor health status) that were not significant predictors in the present study, highlighting potentially important differences between these populations. There is a great need for future research to identify unique predictors that may be specific to this culture.

Among the studied risk factors, only gender and religious affiliation were not found to be associated with MDD in univariate analyses. Only prior mental health distress, prior PTE exposure, and high typhoon exposure all independently conferred risk for MDD in the final model. Similar to MDD, PD had a greater number of univariate and multivariate predictors than did PTSD, and all variables except age and high typhoon exposure were predictive in the final model. In univariate analyses GAD was also associated with prior mental health distress, being older, having poor health status or prior PTE exposure, and having high typhoon exposure; however, in the final model, only prior mental health distress and high typhoon exposure were significant predictors.

Although many of this study's findings bore a similarity to those of recently completed US investigations with hurricane victims (Acierno, Ruggiero, Galea et al., 2007; Acierno, Ruggiero, Resnick et al., 2006; Galea, Brewin, Jones, et al., 2007; Kahn, Mackert & Johnson, 2007; Rhoads, Pearman, Rick, 2007; Weems, Watts, Marsee, 2007; Weisler, Barbee & Townsend, 2006), key differences were also found. Future research should include a wider range of possible variables that may account for variance in symptom presentation, including factors that confer risk, and also factors that may be protective. Identification of risk and resilience factors may help identify those in need for services and support in the wake of a disaster, and as a whole, are a group toward which secondary prevention and educational information should be directed.

Limitations

Although many key findings resulted from this study, it was not without its limitations. Notably, the original research design was not that of a disaster study. As such, extensive risk factors for negative mental health were not assessed, and direct comparison of results from the Vietnamese population and US populations are not completely possible. Measures used were validated on US populations, not Vietnamese populations, suggesting a direction for future research. On a related note, although consistent with previous literature on disasters, several study variables were limited to single item predictors, limiting the reliability of constructs. Moreover, an additional class of interviewers (medical doctors) was added to the Wave 2 data collection effort. Although no differences were noted between interviewer types on DSM-IV diagnoses and other mental health outcome variables (reported elsewhere), the possibility remains that some interviewer effects were present, leading to confounded results. Finally, all data were exclusively self-report in nature, with no behavioral or biological risk or outcome variables assessed.

Conclusions

This study marks the first post-disaster epidemiologic study in Vietnam, thereby filling an important void in the literature. As this is the first post-disaster Vietnamese epidemiological study to have ever been conducted with mental health outcomes, we feel its value overcomes these limitations, particularly in terms of identifying differences in risk factors between this and Western populations (e.g., age and gender effects). Future efforts, including potential follow-up interviews (which should include examination of family cohesion and family separation), will provide very important long term data that speak to the course of mental health

problems precipitated by disaster, and hitherto unknown mental health information in developing Asian countries.

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Table 1

Bivariate Analyses: Risk Factors and PTSD

			Post Typhoon PTSD		
	%	**N**	χ^2	**OR**	**CI**
Wave 1 SRQ-20 Caseness					
Case	6.4	10	11.55**	4.21	1.72-10.29
Non-Case	1.6	10			
Health Status			1.41	1.83	0.66–5.13
Poor	3.1	15			
Good	1.7	5			
Gender			0.29	0.79	0.32–1.91
Female	2.9	10			
Male	2.3	10			
Prior Traumatic Event			12.90***	7.07	2.06–4.33
Yes	4.8	17			
No	0.7	3			
Religious Affiliation			0.85	0.56	0.16–1.94
Yes	1.6	3			
No	2.8	17			
High Typhoon Exposure			6.18*	3.08	1.21–7.81
Yes	4.3	13			
No	1.5	7			

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 2

Logistic Regression: Risk Factors for Post-typhoon Diagnoses

Variable	OR	95% CI	*B*	*W*
PTSD				
Wave 1 SRQ20 (case)	2.76*	1.10-6.93	1.01	4.65
Prior Traumatic Event	5.21**	1.48-18.35	1.65	6.60
High Typhoon Exposure	2.26	.87-5.84	.81	2.81
MDD				
Wave 1 SRQ20 (case)	2.20*	1.09-4.44	.79	4.83
Age	1.01	1.00-1.03	.01	1.20
Health Status (poor)	1.92	.73-5.02	.65	1.77
Prior Traumatic Event	3.19**	1.41-7.21	1.16	7.78
High Typhoon Exposure	3.81***	1.88-7.75	1.34	13.70
PD				
Wave 1 SRQ20 (case)	1.60	.89-2.86	.47	2.49
Age	1.01	.99-1.03	.01	1.64
Health Status (poor)	2.26*	1.07-4.80	.82	4.54
Prior Traumatic Event	3.80***	1.97-7.33	1.33	15.82
Religious Affiliation (No)	.44*	.21-.93	-.82	4.64
High Typhoon Exposure	1.43	.83-2.44	.36	1.68
GAD				
Wave 1 SRQ20 (case)	3.27*	1.17-9.15	1.18	5.06
Age	1.02	.99-1.05	.02	1.93
Health Status (poor)	3.93	.47-32.86	1.37	1.59
Prior Traumatic Events	1.16	.36-3.77	.15	.06
High Typhoon Exposure	4.23*	1.34-13.37	1.44	6.03
Any Disorder				
Wave 1 SRQ20 (case)	1.49	.92-2.42	.40	2.58
Age	1.01	.99-1.02	.01	.45
Health Status (poor)	2.47**	1.30-4.66	.90	7.70
Prior Traumatic Events	3.13***	1.84-5.34	1.14	17.63
High Typhoon Exposure	2.35***	1.50-3.70	.86	13.75

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 3

Bivariate Analyses: Risk Factors and MDD

			Post Typhoon MDD		
	%	**N**	χ^2	**OR**	**CI**
Wave 1 SRQ-20 Caseness			17.23***	3.68	1.92-7.04
Case	14.0	17			
Non-Case	4.3	25			
Health Status			12.30***	4.28	1.78–10.30
Poor	8.5	36			
Good	2.1	6			
Gender					
Female	6.8	26	1.10	1.41	0.74–2.67
Male	4.9	16			
Prior Traumatic Event					
Yes	10.9	33	23.51**	5.41	2.55–11.48
No	2.2	9			
Religious Affiliation			0.14	0.87	0.41–1.85
Yes	5.3	9			
No	6.1	33			
High Typhoon Exposure			22.92***	4.71	2.37-9.37
Yes	11.5	30			
No	2.7	12			

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 4

Bivariate Analyses: Risk Factors and PD

			Post Typhoon PD		
	%	**N**	χ^2	**OR**	**CI**
Wave 1 SRQ-20 Caseness			15.91***	2.87	1.68-4.89
Case	18.2	25			
Non-Case	7.2	42			
Health Status			18.41***	4.10	2.06–8.16
Poor	13.0	57			
Good	3.5	10			
Gender			2.98	1.59	0.94–2.69
Female	7.2	23			
Male	11.0	44			
Prior Traumatic Event			36.25***	5.51	3.00–0.13
Yes	16.7	53			
No	3.5	14			
Religious Affiliation			4.95**	0.45	0.22–0.92
Yes	5.1	9			
No	10.7	58			
High Typhoon Exposure			8.35**	2.08	1.26-3.46
Yes	13.4	36			
No	6.9	31			

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 5

Bivariate Analyses: Risk Factors and GAD

			Post Typhoon GAD		
	%	**N**	χ^2	**OR**	**CI**
Wave 1 SRQ-20 Caseness			16.04***	5.94	2.23-15.88
Case	6.3	10			
Non-Case	1.1	7			
Health Status			7.44**	9.92	1.31–5.16
Poor	3.3	16			
Good	0.3	1			
Gender			1.51	1.91	0.67–5.48
Female	2.7	12			
Male	1.4	5			
Prior Traumatic Event			4.16*	2.86	1.00–8.19
Yes	3.3	12			
No	1.2	5			
Religious Affiliation			1.40	2.04	0.54–0.53
Yes	1.1	2			
No	2.5	15			
High Typhoon Exposure			10.80**	5.46	1.76-16.90
Yes	4.3	13			
No	0.8	4			

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 6

Bivariate Analyses: Risk Factors and Any Disorder

	Post Typhoon Any Disorder				
	%	**N**	**χ^2**	**OR**	**CI**
Wave 1 SRQ-20 Caseness			20.68***	2.74	1.75-4.29
Case	23.0	38			
Non-Case	9.8	62			
Health Status			26.42***	4.19	2.34–7.53
Poor	17.2	86			
Good	4.7	14			
Gender			2.21	1.39	0.90–2.14
Female	14.1	63			
Male	10.6	37			
Prior Traumatic Event			42.65***	4.59	2.82–7.49
Yes	20.8	77			
No	5.4	23			
Religious Affiliation			2.90	0.62	0.36–1.08
Yes	9.0	17			
No	13.7	83			
High Typhoon Exposure			26.39***	3.00	1.94–4.62
Yes	20.2	62			
No	7.8	38			

* $p < .05$.

** $p < .01$.

*** $p < .001$.