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Exposure to Rapid Succession Disasters: A Study of Residents at the Epicenter of the Chilean Bío Bío Earthquake

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We examined cumulative and specific types of trauma exposure as predictors of distress and impairment following a multifaceted community disaster. Approximately 3 months after the 8.8 magnitude earthquake, tsunami, and subsequent looting in Bío Bío, Chile, face-to-face interviews were conducted in 5 provinces closest to the epicenter. Participants ($N = 1{,}000$) were randomly selected using military topographic records and census data. Demographics, exposure to discrete components of the disaster (earthquake, tsunami, looting), and exposure to secondary stressors (property loss, injury, death) were evaluated as predictors of posttraumatic stress (PTS) symptoms, global distress, and functional impairment. Prevalence of probable posttraumatic stress disorder was 18.95%. In adjusted models examining specificity of exposure to discrete disaster components and secondary stressors, PTS symptoms and global distress were associated with earthquake intensity, tsunami exposure, and injury to self/close other. Increased functional impairment correlated with earthquake intensity and injury to self/close other. In adjusted models, cumulative exposure to secondary stressors correlated with PTS symptoms, global distress, and functional impairment; cumulative count of exposure to discrete disaster components did not. Exploratory analyses indicated that, beyond direct exposure, appraising the tsunami and looting as the worst components of the disaster correlated with greater media exposure and higher socioeconomic status, respectively. Overall, threat to life indicators correlated with worse outcomes. As failure of government tsunami warnings resulted in many deaths, findings suggest disasters compounded by human errors may be particularly distressing. We advance theory regarding cumulative and specific trauma exposure as predictors of postdisaster distress and provide information for enhancing targeted postdisaster interventions.

Keywords: posttraumatic stress symptoms, disasters, earthquakes, trauma, Latin America

Superstorm Sandy of 2012, the 2011 Tôhoku Japanese earthquake, and Hurricane Katrina illustrate that natural disasters rarely occur in isolation. Frequently, one catastrophe begets a sequence of deleterious natural and man-made events, exacerbated by interrelated, associated disasters such as levee breakage, looting, or failure of governments to provide significant warnings or timely aid. Globally, natural disasters are increasing in number and severity; recent estimates indicate a 4.4%–7.5% lifetime prevalence of disaster exposure (Kessler, McLaughlin, Koenen, Petukhova, & Hill, 2012). The sixth largest recorded earthquake, an 8.8 magnitude temblor, struck off the coast of Concepción in Bío Bío, Chile, on February 27th, 2010. Millions of people were affected, 521 died, 12,000 were injured, and over 800,000 were displaced (American Red Cross Multi-Disciplinary Team, 2011). The Chilean earthquake typifies many multifaceted modern natural disasters. The earthquake (a primary precipitating event) was followed by two rapid-succession–associated disasters: a devastating tsunami and subsequent flooding that, through failure of the Hydrographic and Oceanographic Service of the Chilean Navy (SHOA), occurred without adequate warning, and several days of looting in the epicenter region.

Exposure to natural disasters is frequently associated with postdisaster mental health problems such as posttraumatic stress disorder (PTSD), global distress, and functional impairment (for reviews, see Garfin & Silver, in press; Norris et al., 2002), although many survivors will exhibit striking resilience (Bonanno, Brewin, Kaniasty, & La Greca, 2010). Much prior literature has nonetheless been limited by methodological weaknesses (e.g., nonrepresentative samples) and a narrow inclusion of predictors

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and outcomes (Bonanno et al., 2010; Garfin & Silver, in press). The present study addressed these limitations through a theoretically derived, multivariate inquiry into predictors of postdisaster distress and functioning using an epidemiological sample of adults directly exposed to the Bío Bío earthquake. Within a cross-cultural setting, we advance theories regarding responses to disasters specifically and trauma more generally by examining the influence of type and amount of trauma exposure and other key predictors, such as predisaster individual characteristics (Brewin, Andrews, & Valentine, 2000; Ozer, Best, Lipsey, & Weiss, 2003), on several postdisaster outcomes following the earthquake and associated disasters. Each will be considered in turn.

Type of Disaster

Multifaceted disasters are common, yet surprisingly few studies have unpacked potential differences in how the type of disaster correlates with negative outcomes. Although the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; DSM-5, American Psychiatric Association, 2013) groups all potentially traumatic events under "Criterion A" (stressor) for PTSD, research on risk perception has indicated differential associations between disaster types and hazard judgments (e.g., Ho, Shaw, Lin, & Chiu, 2008); such variability may also extend to other outcomes including postdisaster psychopathology. Decades ago, Brim (1980) theorized that the type of life event might differentially influence psychological processes. Baum (1987) posited community disasters with a man-made component might elicit greater distress compared to other events. In contrast, events involving social breakdown, such as looting, might more strongly influence distress by violating a world view that assumes community safety and trustworthy neighbors (Janoff-Bulman, 1992).

Yet recent research has largely ignored specificity in disaster type. Exceptions include Norris and colleagues' (2002) literature review, which suggested violent disasters may be correlated with worse outcomes, and an empirical study comparing victims of political violence and earthquakes that found no differences between groups experiencing one event compared to another (Goenjian et al., 1994). Exploring how discrete disaster components (earthquake, tsunami, looting) correlate with psychological outcomes may address these theoretical questions and inform targeted allocation of limited postdisaster resources.

Exposure to Disaster-Related Secondary Stressors

Exposure to individual-level stressors occurring during or in the immediate aftermath of a disaster (e.g., property loss, injury, death) may influence mental health outcomes. Such occurrences have been conceptualized as "secondary stressors" in past postdisaster epidemiological studies (Galea et al., 2007; Kessler et al., 2012). After Hurricane Katrina, an event conceptually similar to the Chilean earthquake (i.e., a multifaceted natural disaster exacerbated by man-made failings), specificity in exposure to individual-level secondary stressors was associated with *DSM–IV* (American Psychiatric Association, 2000) anxiety disorders and PTSD (Galea et al., 2007); physical injury and adversity were particularly strong correlates of distress for those highly exposed. Clarifying how specific disaster-related stressors may be associated with postdisaster outcomes could further refine the design of interventions and answer theoretical questions regarding the role of specificity of traumatic stress exposure in negative outcomes (Brewin et al., 2000; Galea et al., 2007; Ozer et al., 2003).

Cumulative Exposure

Alternatively, cumulative—rather than a specific type of—exposure to discrete disaster components and specific secondary stressors may predict postdisaster difficulties (Norris et al., 2002; Seery, Holman, & Silver, 2010; Turner & Lloyd, 1995). For example, after the 1988 Armenian earthquake, combined earthquake and political violence exposure predicted psychological distress; differential responses were not found between groups exposed to only one of those two events (Goenjian et al., 1994). More generally, number of traumatic events often predicts negative outcomes (Chapman et al., 2004), although not necessarily in a linear, "dose-response" relationship (Seery et al., 2010). Furthermore, exposure to negative events often co-occurs, particularly after large-scale disasters, yet few studies have considered additive effects of exposure to greater numbers of discrete disaster components or the secondary stressors that accompany such catastrophes.

Predisaster Individual Characteristics

Empirical evidence also indicates that preexisting individual-level characteristics can influence postdisaster mental health (Hobfoll, 1989; Norris et al., 2002). Demographic and socioeconomic indicators are frequently implicated, albeit at times inconsistently (e.g., Brewin et al., 2000; Norris et al., 2002). For example, females (Bonanno et al., 2010), individuals from disadvantaged backgrounds (Norris et al., 2002), and those with prior mental health problems (Norris et al., 2002; Silver, Holman, McIntosh, Poulin, & Gil-Rivas, 2002) are typically at greater risk for difficulties postdisaster. The roles of marital status and age in postdisaster outcomes have been inconsistent (Brewin et al., 2000; Norris et al., 2002), although married persons and younger individuals tend to exhibit different responses than comparison groups; age effects may vary based on event-type and outcome measure (Garfin & Silver, in press; Scott, Poulin, & Silver, 2013). Consequently, such individual-level characteristics should be considered in epidemiological assessments of postdisaster mental health and functioning.

The Present Study

In sum, prior work suggests that type of traumatic event (both disaster component and secondary stressor) may differentially influence postdisaster psychological outcomes. Other evidence indicates that the aggregate number of traumatic events may also be an important indicator of negative outcomes. Little, if any, research has contrasted these predictors following a disaster where a series of catastrophic events (earthquake, tsunami, looting) and a variety of secondary stressors occur rapidly. Moreover, as noted in seminal meta-analyses (Brewin et al., 2000; Ozer et al., 2003), a key problem with examining theoretical predictors of posttraumatic responses is the heterogeneity of precipitating traumas. Studying reactions to an exogenous sequence of events such as the Chilean earthquake—with clearly demarcated categories of exposure—allows for a naturalistic "control" of factors that typically vary when comparing across disasters (e.g., Kessler et al., 2012) or other traumatic events (e.g., comparing child abuse to military combat; Seery et al., 2010).

The present study examined how exposure to different types of disaster component (earthquake, tsunami and subsequent flooding, looting) and secondary stressors (property loss, injury, death) differentially predicted deleterious outcomes following the Bío Bío Chilean earthquake. Specificity of exposure was also compared to cumulative exposure to these stressors. In addition, the role of predisaster individual characteristics was considered. We had several predictions. First, we expected that both specificity in exposure to secondary stressors and associated disasters, as well as cumulative counts of exposure, would be associated with negative outcomes. Second, similar to past epidemiological studies, we expected individual-level predictors (female gender, lower socioeconomic status [SES], mental health history) to correlate with postdisaster responses. We also explored which disaster components would be appraised as the worst. The tsunami, which had a man-made component, might be most distressing, yet the looting might be viewed as worse since it represented a breakdown in perceptions of community safety and/or benevolence of one's neighbors.

Method

Procedures

Shortly after the earthquake, Ipsos Public Affairs, an international policy and market research company, obtained a representative sample of 2,008 Chilean adults aged 15–90 who lived in provinces across Chile; the present study utilized a subsample of Chileans who lived in five regions closest to the earthquake's epicenter (Concepción, Talcahuano, Tomé, Lota, and Talca). Data were collected via 35–40 minute face-to-face interviews from May 13 to June 7, 2010. Demographic quota sampling cells, constructed from Chilean National Statistics Institute census population estimates of region, gender, and age, determined participation eligibility. Geographic sampling maps were derived from these estimates along with topographic data from the Military Geographic Institute. Interviewers approached 4,221 homes and contacted a total of 1,711 eligible individuals; 1,004 participated in the interviews, resulting in a 59% participation rate. Demographic information (age, marital status, gender) was recorded by interviewers.

Homes were approached at least twice at different times of the day to account for varying work/activity schedules. If residents could not be reached, the interviewer would solicit information from neighbors to ensure vacancies were not systematic (e.g., due to property loss during the disaster or socioeconomic status). Interviewers attempted to find absent residents based on neighbor reports of work schedule, vacation plans, or relocation of the household to another property. Since the majority of people who lost their homes from the earthquake subsequently resided in tents on their own property (Jaime Vásquez, personal communication, 2013), earthquake-related vacancies were not a serious concern in interview solicitation.

Interviews were conducted in Spanish by professional staff trained by Ipsos in administering face-to-face interviews. Verbal consent was obtained from all participants. All measures were written in English and then translated and back-translated by Chilean bilingual psychologists (FJU, HL) and checked for linguistic and cultural accuracy.

Data from the interviews were entered manually into a database, with 5% of all responses reentered to check for data entry errors. The study was approved by the Institutional Review Boards at the University of California, Irvine, and Universidad Andrés Bello, Santiago.

Outcome Measures

Posttraumatic stress (PTS) symptoms. The PTSD Checklist (PCL; Weathers, Litz, Herman, Huska, & Keane, 1993), a well-validated 17-item self-report measure, was used to assess PTS symptoms. Individuals rated how distressed or bothered they were by symptoms related to the Chilean earthquake, tsunami, and their aftermath over the prior 7 days, with endpoints 1 (*not at all*) to 5 (*extremely*). Responses were summed to create a continuous measure of PTS symptoms (range 17–85); this continuous measure was utilized to account for variability in symptom severity in an inherently dimensional construct (cf. MacCallum, Zhang, Preacher, & Rucker, 2002). To estimate prevalence of probable PTSD, the PCL was scored according to a cutoff of 50, which is the most conservative estimate commonly used, as well as using *DSM–IV* scoring criteria (Ruggiero, Del Ben, Scotti, & Rabalais, 2003). Studies using confirmatory factor analysis have shown equivalence between Spanish and English versions of the PCL (Marshall, 2004).

Global distress. Distress was measured using the 18-item Brief Symptom Inventory (BSI-18; Derogatis, 2001). Respondents indicated their level of distress in the past 7 days (including the day of completion), with endpoints 1 (*not at all*) to 5 (*extremely*). The BSI-18 has been validated in community-based and medical samples and has demonstrated excellent reliability in field studies (Derogatis, 2001). Spanish versions have shown equivalence (Ruipérez, Ibáñez, Lorente, Moro, & Ortet, 2001). Internal consistency was excellent (range 18–90; $\alpha = .95$).

Functional impairment. Four items modified from the Short Form 36 Health Survey (SF-36; Ware & Sherbourne, 1992) assessed impairment in work and social activities occurring as a consequence of physical or emotional health problems (range = 1–5, $\alpha = .93$). A similar modification of the SF-36 was used in a prior epidemiological assessment of psychological outcomes following exposure to adverse events (Seery et al., 2010); Spanish versions of the SF-36 have indicated equivalence (Alonso, Prieto, & Antó, 1995).

Disaster-Related Characteristics

Earthquake intensity. The degree of destruction experienced during the earthquake was assessed using a version of the Modified Mercalli Intensity Scale (Wood & Neumann, 1931), commonly implemented to assess earthquake intensity for the non-scientist population (U.S. Geological Survey, 2013a). Participants reported their experience of the earthquake the night it occurred on an 8-point scale: 1 (*not perceptible*), 2 (*felt slightly, no damage to objects*), 3 (*weakly felt, objects moved slightly*), 4 (*objects swayed, glass and windows rattled*), 5 (*strong shaking or rocking of entire building*), 6 (*objects broke, cracks in plaster*), 7 (*serious damage to surroundings*), 8 (*destructive, forcibly thrown to the ground,* *many objects broken, walls collapsed, location uninhabitable/unlivable*). Four participants indicated that the earthquake was "not perceptible"; they were deleted from the final sample, resulting in $N = 1{,}000$.

Two additional measures of earthquake intensity were computed: residential region and kilometers from the geologic epicenter. The pattern of results was identical for all three measures; results using the Mercalli Intensity Scale are reported in the text and tables as this measure accounted for geographic variability in earthquake destruction and intensity and is more commonly used in research on earthquakes.

Additional disaster exposure. Participants also reported whether they were at the coast as the tsunami occurred, coded 0 (*not at the coast*), 1 (*at the coast when tsunami hit*). Looting exposure was assessed by asking participants whether they witnessed looting directly, participated in looting, lost property in looting, or knew someone close who lost property in the looting; endorsing any of these exposures was considered an affirmative exposure, coded 0 (*no looting exposure*), 1 (*looting exposure*).

A continuous variable of cumulative disaster exposure was also created via a count of exposure to the three disasters (earthquake, tsunami, looting; $M = 1.57$, $SD = 0.55$, range 1–3).

Exposure to secondary stressors. Participants reported experience with three possible secondary stressors to which they or a close other could have been exposed as a result of the earthquake and its aftermath. To remain consistent with *DSM–IV* (American Psychiatric Association, 2000) criterion A for exposure to potentially traumatic events, both experiences for self and close other were assessed. Items were modified from prior research on community disasters (Holman & Silver, 1998; Silver et al., 2002). Disaster-related property loss was assessed and categorized 0 (*no property loss*) or 1 (*personally lost property in earthquake, tsunami, or looting and/or close other lost property*). Participants reported experience with injury resulting from the earthquake, tsunami, or looting; responses were categorized 0 (*no injury*) or 1 (*personally injured and/or close other injured*). Disaster-related death was also assessed; responses were dichotomized 0 (*no death experience*) or 1 (*personally knew someone who died in the earthquake or tsunami*).

Exposures to potential secondary stressors (personally lost property, close other lost property, injury to self, injury to close other, knew someone who died) were counted and combined into a continuous measure of cumulative secondary stressors experienced ($M = 1.25$, $SD = 1.01$, range $= 0$–5).

Disaster appraisal. Participants were asked which of the three components of the disaster (earthquake, tsunami and associated flooding, or looting) they experienced as the worst; participants could select only one.

Individual-Level Characteristics

Socioeconomic status (SES). A socioeconomic score (called the E&E Socioeconomic Classification in Chile) was calculated using type of employment and education level of head of household. This measure is commonly used in Chilean market and epidemiological research and correlates strongly with household income (Asociación Investigadores de Mercado [AIM] Chile, 2008; Ipsos, 2010). The E&E is computed by asking respondents the education level (seven possible choices range from "less than primary school" to "graduate degree obtained") and type of work (six possible choices range from "occasional work/unemployed" to "organization director") of the head of household. Households are then categorized via a matrix of possible responses and grouped into the greater than 90th, 70th, 45th, 10th, and lower than 10th percentiles (AIM Chile, 2008; Ipsos, 2010); lower percentiles indicate higher SES. This score was standardized and used as a continuous measure of SES in analyses ($M = 3.27$, $SD = 1.00$, range 1–5).

Physician-diagnosed mental health history. Participants reported any doctor or health care professional diagnosis of depression or anxiety disorder prior to February 2010 (before the earthquake). A continuous variable of physician-diagnosed mental health ailments was coded 0 (*no history of depression or anxiety disorder*), 1 (*history of depression or anxiety disorder*), or 2 (*history of both depression and anxiety disorder*). Similar categorizations have been used in past research (e.g., Holman, Garfin, & Silver, 2014; Silver et al., 2002).

Demographics. Gender was coded 0 (*male*), 1 (*female*). Marital status was coded as (a) single (never married), (b) married, or (c) widowed, divorced, or separated. Married persons comprised the reference group (coded "0" in analyses) as they often exhibit differential outcomes when compared to individuals who do not have a spouse present (Garfin & Silver, in press). Age was grouped into six categories (15–24, 25–34, 35–44, 45–54, 55–64, 65+). Individuals 15–24 years old comprised the reference group (coded "0" in analyses) since past research suggests younger individuals exhibit differential postdisaster distress responses when compared to older individuals (Garfin & Silver, in press; Norris et al., 2002).

Statistical Analyses

Statistical analyses were conducted using STATA 11.0 (Stata Corp, College Station, TX), a program well-suited for handling weighted survey data. Ipsos provided poststratification weights, calculated by multiplying individuals in a given demographic category (i.e., age, city population, gender) by a factor proportional to Census estimates of that particular demographic category and inversely proportional to the number obtained in our sample. Analyses were then weighted to adjust for differences in sample composition compared to Chilean census data, facilitating stronger population-based inferences.

First, we calculated descriptive statistics of exposure to the earthquake, tsunami and looting, PTS symptoms and probable rates of PTSD, and participants' appraisal of which disaster component was the worst. Then, bivariate regression analyses examined independent associations between each of the three outcome variables (PTS symptoms, global distress, functional impairment) and individual and cumulative exposure to the disasters (earthquake, tsunami, looting) and individual and cumulative exposure to secondary stressors (property loss, injury, death).

Multivariate methods are recommended for postdisaster epidemiological studies to illustrate the independent contribution of covariates while controlling for the relative contribution of predictors (Bonanno et al., 2010). We conducted multivariate regression models that analyzed predictors of PTS symptoms, global distress, and functional impairment. For each of the three outcome variables, two sets of multivariate ordinary least squares (OLS) regression models were constructed using a hierarchical variable entry strategy. The first set examined the potential *specific* effects of exposure to the disasters and their secondary stressors. The second set examined the potential *cumulative* effects of exposure to the disasters (earthquake, tsunami, looting) and three types of secondary stressors (property loss, injury, death). On Step 1, disaster exposure variables (either dummy coded exposure variables to examine specific effects or counts of exposure to examine cumulative exposure) were entered. On Step 2, all other variables (physician-diagnosed mental health history, SES, demographics) were entered.

Interactions between specific and cumulative exposure to the three components of the disaster and specific and cumulative exposure to secondary stressors were examined. Interactions between SES and the three secondary stressors were tested according to theoretical significance (Galea et al., 2007).

Results

Sample

Table 1 presents the demographic composition of the sample compared to Chilean census benchmarks. The sample was 46.10% married (unweighted $n = 456$); 12.74% widowed, divorced, or separated (unweighted $n = 128$); and 41.16% single (unweighted $n = 415$).

Table 2 presents weighted and unweighted percentages of participants' exposure to the Chilean disaster, the component of the disaster participants appraised as the worst, the percentage with PTS symptoms, and rates of probable PTSD. Almost half of the sample reported intrusion/reexperiencing symptoms, and depending on scoring criteria, almost one fifth met *DSM–IV* diagnostic criteria for probable PTSD. Mean score on the PCL = 30.11 (95% confidence interval [CI], 29.18–31.05), M on the BSI-18 = 31.31 (95% CI, 30.39–32.22), and on the measure of functional impairment, $M = 1.55$ (95% CI, 1.49–1.60). All participants were directly exposed to the earthquake; approximately 46% of the sample (unweighted $n = 454$) did not have direct experience with an associated disaster (tsunami or looting). Direct exposure to the looting was reported by 49.56% (unweighted $n = 498$), 26 (2.63%) participants were exposed to the tsunami but not the looting, and 22 (2.08%) were directly exposed to all three disasters.

Table 1
Demographic Composition of the Sample and Comparisons With Chilean Census Data[a] (N = 1,000)

	N	% Weighted (unweighted)	Chilean Census data for epicenter region, %
Gender			
Male	476	48.08 (47.60)	48.5
Female	524	51.92 (52.40)	51.5
Age[b]			
15–29	326	33.53 (32.60)	36.0
30–44	296	26.53 (29.60)	29.0
45–59	222	23.13 (22.20)	20.0
60–74	113	21.14 (11.30)	11.0
75+	43	4.67 (4.30)	5.0
Socioeconomic status[b,c]			
Below 10th	55	5.72 (5.50)	4.0
11th–45th	154	15.18 (15.40)	13.0
46th–70th	339	33.84 (33.90)	21.0
71st–90th	370	36.88 (37.00)	40.0
91st–100th	82	8.38 (8.20)	21.0

[a] Provided by Ipsos for the specific regions surveyed, based on 2002 data from the Chilean National Institute of Statistics. [b] Categories are adjusted to be consistent with available census data. [c] Ranked as percentiles of Chilean population; lower percentile represents higher socioeconomic status.

Table 2
Disaster Exposure and Posttraumatic Stress Symptomatology (N = 1,000)

	N	% Weighted (unweighted)
Earthquake intensity (Mercalli Scale)		
Low (2–4)	19	1.93 (1.93)
Moderate (5–6)	359	36.00 (36.41)
High (7–8)	608	62.07 (61.66)
Injury[a]		
None	908	90.56 (90.80)
Personal injury	36	3.92 (3.60)
Close other	65	6.67 (6.50)
Property loss[a]		
None	312	31.57 (31.20)
Personal loss	559	55.78 (55.90)
Close other	393	38.72 (39.30)
Death experience		
None	800	80.12 (80.00)
Knew someone	200	19.88 (20.00)
Disaster exposure[a]		
Earthquake only	454	45.72 (45.40)
Tsunami	48	4.71 (4.80)
Looting	524	52.19 (52.19)
Which component of the disaster was the worst for you?		
Earthquake	477	48.12 (47.70)
Tsunami	250	24.74 (25.00)
Looting	273	27.15 (27.30)
Posttraumatic stress symptomatology		
Avoidance symptoms	224	22.74 (22.40)
Intrusion symptoms	458	45.56 (45.80)
Hyperarousal symptoms	316	31.65 (31.60)
Probable PTSD DSM-IV dx	187	18.95 (18.70)
PCL score over 50	123	12.70 (12.45)

Note. PTSD = posttraumatic stress disorder; DSM–IV = *Diagnostic and Statistical Manual of Mental Disorders–IV-Text Revision*; dx = diagnosis; PCL = PTSD Checklist.
[a] Participants could be counted in more than one category.

Correlates of Psychological Outcomes

Table 3 presents bivariate relationships between specific and cumulative disaster exposure variables and PTS symptoms, global distress, and functional impairment (not adjusting for covariates) to illustrate the independent effects of predictors included in the multivariate models. Earthquake intensity was positively associated with PTS symptoms, global distress, and functional impairment; exposure to the tsunami was associated with PTS symptoms and global distress; and exposure to the looting was negatively associated with functional impairment. Property loss (to self or close other) and injury (to self or close other) were positively associated with PTS symptoms, global distress, and functional impairment. Knowing someone who died in the earthquake or tsunami was not associated with any of the three outcome vari-

Table 3
Bivariate Relationships Between Exposure Variables and Posttraumatic Stress Symptoms, Global Distress, and Functional Impairment[a]

Variable	Posttraumatic stress symptoms β (95% CI)	Global distress β (95% CI)	Functional impairment β (95% CI)
Disaster exposure			
Earthquake intensity (Mercalli Scale)	0.19 (0.13–0.25)***	0.18 (0.12–0.23)***	0.17 (0.10–0.24)***
Tsunami (0, 1)[b]	0.76 (0.41–1.10)***	0.62 (0.29–0.95)***	0.12 (0.22–0.47)
Looting (0, 1)[b]	−0.10 (−0.23–0.02)	−0.10 (−0.22–0.03)	−0.20 (−0.32–0.07)**
Cumulative exposure to disasters (earthquake, tsunami, looting; 1–3)	0.18 (0.11–0.25)***	0.15 (0.08–0.21)***	0.16 (0.09–0.22)***
Secondary stressors			
Property loss (0, 1)[c]	0.26 (0.13–0.39)***	0.25 (0.12–0.38)***	0.26 (0.14–0.39)***
Injury (0, 1)[d]	0.63 (0.36–0.90)***	0.53 (0.30–0.76)***	0.46 (0.19–0.73)**
Death experience (0, 1)[e]	0.16 (−0.01–0.32)	0.06 (−0.09–0.21)	0.12 (−0.05–0.30)
Cumulative number of secondary stressors (property loss, injury, death experience; 0–5)	0.20 (0.13–0.27)****	0.17 (0.10–0.23)***	0.19 (0.12–0.26)***

Note. CI = confidence interval.
[a] Coefficients reflect bivariate relationship between each independent and dependent variable and do not control for covariates. [b] 0 = *no direct exposure*, 1 = *direct exposure*. [c] 0 = *no property loss*, 1 = *personally lost property or close other lost property*. [d] 0 = *no injury*, 1 = *personally injured or close other injured*. [e] 0 = *did not know anyone who died*, 1 = *knew someone who died*.
* $p < .05$. ** $p < .01$. *** $p < .001$.

ables. Cumulative exposure to disasters and cumulative number of secondary stressors (property loss, injury, death) were positively associated with PTS symptoms, global distress, and functional impairment.

Specific Exposure to Disasters and Secondary Stressors

Table 4 presents standardized OLS regression coefficients for type of exposure to the disasters and secondary stressors, other key predictor variables, and PTS symptoms, global distress, and functional impairment. As depicted under Step 1 for each outcome variable, after controlling for the relative contribution of each exposure variable listed, earthquake intensity was positively associated with PTS symptoms, global distress, and functional impairment. Tsunami exposure was positively associated with PTS symptoms and global distress. Exposure to looting was negatively associated with functional impairment. Property loss and injury were associated with PTS symptoms, global distress, and functional impairment. The columns under Step 2 illustrate the correlation between exposure variables and each of the three outcome variables after controlling for the relative contribution of the other predictor variables. These results illustrate that earthquake intensity, injury, physician-diagnosed mental health history, lower SES, and female gender were positively associated with PTS symptoms, global distress, and functional impairment.

Cumulative Exposure to Disasters and Secondary Stressors

Table 5 presents standardized OLS regression coefficients for cumulative exposure to disaster-related events, other key predictor variables, and PTS symptoms, global distress, and functional impairment. While cumulative disaster exposure was not associated with any of the three outcomes in any of the multivariate analyses, cumulative secondary stressor exposure was associated with all three outcomes. In addition, earthquake intensity was positively associated with PTS symptoms, global distress, and functional impairment. Female gender, physician-diagnosed mental health history, and lower SES were correlated with PTS symptoms, global distress, and functional impairment (see Step 2 under each outcome variable).

Interactions

None of the interaction terms examined were significant predictors of any of the three outcomes.

Exploratory Analyses

Interestingly, the number of participants ($n = 250$, 24.74%) who endorsed the tsunami as the worst component of the disaster was substantially greater than the number who reported experiencing the disaster as it occurred ($n = 48$, 4.71%). We conducted post hoc analyses to examine what factors, including direct exposure to the event, might be associated with selection of the worst component. A multivariate multinomial logistic regression identified predictors of one's appraisal of the worst aspect of the disaster; selecting the earthquake comprised the base category (i.e., served as the comparison group). Earthquake intensity, associated disaster exposure (tsunami and/or looting), secondary stressors (property loss, injury, death), SES, and postdisaster media exposure, were selected as potential correlates, consistent with recent epidemiological research on collective trauma (Holman et al., 2014). To assess media exposure, participants reported, on average, how many hours per day they spent (a) watching TV or listening to radio coverage of the earthquake, tsunami, and their aftermath; and (b) reading books, magazines or newspaper coverage of the earthquake, tsunami, and their aftermath. Responses were averaged ($M = 1.77$,

Table 4
Multivariate Ordinary Least Squares Regression Analyses of Key Predictor Variables, Exposure to Specific Disaster-Related Events, and Posttraumatic Stress Symptoms (N = 974),[a] Global Distress (N = 968),[a] and Functional Impairment (N = 985)[a]

Variable	Posttraumatic stress symptoms		Global distress		Functional impairment	
	Step 1[b]	Step 2[b]	Step 1[b]	Step 2[b]	Step 1[b]	Step 2[b]
	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
Disaster exposure						
Earthquake intensity (Mercalli Scale)	0.14 (0.08–0.20)***	0.10 (0.04–0.16)**	0.14 (0.08–0.20)***	0.09 (0.03–0.14)**	0.15 (0.08–0.21)***	0.11 (0.04–0.17)**
Tsunami (0, 1)[c]	0.66 (0.31–1.00)***	0.58 (0.23–0.93)**	0.52 (0.18–0.86)**	0.45 (0.13–0.77)**	0.03 (−0.29–0.36)	−0.00 (−0.31–0.31)
Looting (0, 1)[c]	−0.10 (−0.23–0.02)	−0.02 (−0.13–0.10)	−0.09 (−0.21–0.03)	0.02 (−0.09–0.13)	−0.20 (−0.32–−0.07)**	−0.13 (−0.24–0.01)*
Secondary stressors						
Property loss (0, 1)[d]	0.16 (0.03–0.28)*	0.04 (−0.08–0.15)	0.17 (0.03–0.30)*	0.02 (−0.09–0.14)	0.18 (0.06–0.31)**	0.05 (−0.06–0.16)
Injury (0, 1)[e]	0.50 (0.23–0.78)***	0.43 (0.18–0.67)**	0.44 (0.20–0.68)***	0.35 (0.14–0.56)**	0.35 (0.07–0.62)*	0.26 (0.02–0.51)*
Death experience (0, 1)[f]	0.11 (−0.06–0.27)	0.02 (−0.12–0.17)	0.01 (−0.14–0.17)	−0.08 (−0.22–0.05)	0.07 (−0.10–0.25)	−0.00 (−0.16–0.15)
MD-dx mental health history		0.29 (0.22–0.36)***		0.33 (0.27–0.39)***		0.37 (0.30–0.44)***
Socioeconomic status[g]		0.12 (0.07–0.17)***		0.13 (0.08–0.18)***		0.07 (0.01–0.13)*
Gender[h]						
Male (reference group)						
Female		0.34 (0.22–0.47)***		0.31 (0.20–0.43)***		0.11 (0.00–0.23)
Marital status[i]						
Married (reference group)						
Widowed, divorced, or separated		0.12 (−0.09–0.32)		0.20 (−0.02–0.41)		0.16 (−0.05–0.38)
Single		−0.15 (−0.31–0.01)		−0.09 (−0.23–0.06)		−0.14 (−0.29–0.02)
Age[j]						
15–24 (reference group)						
25–34		0.05 (−0.13–0.23)		0.15 (−0.01–0.30)		0.05 (−0.10–0.20)
35–44		0.08 (−0.12–0.28)		0.20 (0.02–0.38)*		0.10 (−0.09–0.28)
45–54		0.14 (−0.08–0.36)		0.37 (0.16–0.57)***		0.25 (0.04–0.45)*
55–64		0.02 (−0.22–0.27)		0.22 (−0.01–0.44)		−0.04 (−0.26–0.18)
65+		0.04 (−0.23–0.32)		0.33 (0.08–0.59)*		0.34 (0.08–0.61)*
Model statistics	$F(6, 975) = 12.87$, $p < .001$, $R^2 = .09$	$F(16, 957) = 21.53$, $p < .001$, $R^2 = .26$	$F(6, 962) = 11.64$, $p < .001$, $R^2 = .07$	$F(16, 951) = 29.37$, $p < .001$, $R^2 = .30$	$F(6, 979) = 10.65$, $p < .001$, $R^2 = 0.06$	$F(16, 951) = 20.00$, $p < .001$, $R^2 = .26$

Note. CI = confidence interval; MD-dx = doctor-diagnosed; PTS = posttraumatic stress.
[a] *N* differs from full sample due to listwise deletion of missing data. [b] Variables listed below each step were entered simultaneously and control for the relative contribution of each other. [c] 0 = *no direct exposure*, 1 = *direct exposure*. [d] 0 = *no property loss*, 1 = *personally lost property or close other lost property*. [e] 0 = *no injury*, 1 = *personally injured or close other injured*. [f] 0 = *did not know anyone who died*, 1 = *knew someone who died*. [g] Lower percentile represents higher socioeconomic status. [h] Gender coded, 0 = *male*, 1 = *female*. [i] In analyses not shown, after adjusting for all covariates, results of omnibus tests for marital status were (a) PTS symptoms: $F(2, 957) = 2.82$, $p = .060$, $\Delta R^2 = 0.005$; (b) global distress: $F(2, 951) = 2.68$, $p = .069$, $\Delta R^2 = 0.005$; and (c) functional impairment: $F(2, 968) = 3.33$, $p = .036$, $\Delta R^2 = 0.01$. [j] In analyses not shown, after adjusting for all covariates, results of omnibus tests for age were (a) PTS symptoms: $F(5, 957) = 0.43$, $p = .829$, $\Delta R^2 = 0.002$; (b) global distress: $F(5, 951) = 2.79$, $p = .016$, $\Delta R^2 = 0.011$; and (c) functional impairment: $F(5, 968) = 2.57$, $p = .026$, $\Delta R^2 = 0.012$.
$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Table 5
Multivariate Ordinary Least Squares Regression Analyses of Key Predictor Variables, Cumulative Exposure to Disaster-Related Events, and Posttraumatic Stress Symptoms (N = 974),[a] Global Distress (N = 968),[a] and Functional Impairment (N = 985)[a]

	Posttraumatic stress symptoms		Global distress		Functional impairment	
	Step 1[b]	Step 2[b]	Step 1[b]	Step 2[b]	Step 1[b]	Step 2[b]
Variable	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
Disaster exposure						
Earthquake intensity (Mercalli Scale)	0.16 (0.10–0.22)***	0.11 (0.05–0.17)***	0.15 (0.09–0.21)***	0.10 (0.04–0.15)***	0.14 (0.08–0.21)***	0.10 (0.04–0.16)**
Cumulative exposure to disaster (1–3)	−0.04 (−0.20–0.12)	−0.07 (−0.21–0.07)	−0.06 (−0.21–0.09)	−0.11 (−0.24–0.02)	−0.10 (−0.26–0.06)	−0.14 (−0.28–0.00)
Cumulative number of secondary stressors (0–5)	0.20 (0.04–0.37)*	0.17 (0.02–0.31)*	0.19 (0.04–0.35)*	0.16 (0.03–0.29)*	0.26 (0.09–0.43)**	0.22 (0.07–0.37)**
MD-dx mental health history (0–2)		0.29 (0.22–0.35)***		0.33 (0.28–0.39)***		0.37 (0.30–0.44)***
Socioeconomic status[c]		0.13 (0.08–0.18)***		0.13 (0.08–0.19)***		0.07 (0.02–0.13)*
Gender[d]						
Male (reference group)						
Female		0.34 (0.23–0.46)***		0.31 (0.20–0.43)***		0.12 (0.01–0.24)*
Marital status[e]						
Married (reference group)						
Widowed, divorced, or separated		0.11 (−0.10–0.32)		0.19 (−0.03–0.41)		0.15 (−0.07–0.36)
Single		−0.19 (−0.34–−0.03)**		−0.12 (−0.27–0.03)		−0.16 (−0.31–0.00)
Age[f]						
15–24 (reference group)						
25–34		0.02 (−0.15–0.20)		0.12 (−0.04–0.28)		0.06 (−0.09–0.21)
35–44		0.04 (−0.16–0.23)		0.16 (−0.02–0.34)		0.09 (−0.09–0.28)
45–54		0.10 (−0.12–0.32)		0.33 (0.12–0.53)**		0.25 (0.04–0.46)*
55–64		−0.02 (−0.26–0.23)		0.17 (−0.05–0.40)		−0.03 (−0.24–0.19)
65+		−0.02 (−0.29–0.25)		0.28 (0.02–0.53)*		0.35 (0.09–0.61)**
Model statistics	$F(3, 970) = 21.08$, $p < .001$, $R^2 = .06$	$F(13, 959) = 24.89$, $p < .001$, $R^2 = .24$	$F(3, 964) = 19.61$, $p < .001$, $R^2 = .09$	$F(13, 953) = 35.41$, $p < .001$, $R^2 = .29$	$F(3, 981) = 17.08$, $p < .001$, $R^2 = .06$	$F(13, 970) = 24.46$, $p < .001$, $R^2 = .26$

Note. CI = confidence interval; MD-dx = doctor-diagnosed; PTS = posttraumatic stress.
[a] *N* differs from full sample due to listwise deletion of missing data. [b] Variables listed below each step were entered simultaneously and control for the relative contribution of each other. [c] Lower percentile represents higher socioeconomic status. [d] Gender coded 0 = *male*, 1 = *female*. [e] In analyses not shown, after adjusting for all covariates, results of omnibus tests for marital status were (a) PTS symptoms: $F(2, 959) = 3.73$, $p = .024$, $\Delta R^2 = 0.007$; (b) global distress: $F(2, 953) = 2.68$, $p = .004$, $\Delta R^2 = 0.012$; and (c) functional impairment: $F(2, 970) = 3.55$, $p = .029$, $\Delta R^2 = 0.006$. [f] In analyses not shown, after adjusting for all covariates, results of omnibus tests for age were (a) PTS symptoms: $F(5, 959) = 0.32$, $p = .899$, $\Delta R^2 = .002$; (b) global distress: $F(5, 953) = 2.11$, $p = .0625$, $\Delta R^2 = 0.008$; and (c) functional impairment: $F(5, 970) = 2.47$, $p = .031$, $\Delta R^2 = 0.012$.
* $p < .05$. ** $p < .01$. *** $p < .001$.

SD = 2.52, range = 0–12.5) to obtain a mean media exposure score.

Results are reported as relative rate ratios (RRRs), which can be interpreted in a manner similar to odds ratios in logistic regression analyses. Endorsing the tsunami as the worst aspect of the disaster was positively associated with having been at the coast where the tsunami hit (RRR = 3.19, 95% CI, 1.61–6.32, p = .001) and with increased disaster-related media exposure (RRR = 1.04, 95% CI, 0.97–1.11, p = .003); it was negatively associated with directly experiencing the looting (RRR = 0.61, 95% CI, 0.44–0.84, p = .003). Endorsing the looting as the worst component of the disaster was associated with higher SES (RRR = 0.62, 95% CI, 0.53–0.72, p < .001).

Discussion

The Bío Bío earthquake resulted in a series of traumatic events and mental health consequences for many residents near the epicenter. Logistical difficulties such as obtaining funding and rapid ethics approval typically preclude short-term postdisaster psychiatric epidemiological assessments (Norris, 2006). Nonetheless, early postdisaster assessments may help inform intervention efforts (Bryant & Litz, 2009) by helping to identify at-risk populations, important given the potential benefit of short-term interventions (Bonanno et al., 2010). By collecting data among a demographically representative sample of directly exposed residents shortly after the earthquake, we improve on methodological limitations of prior research and address the charge to use more sophisticated techniques in postdisaster assessments (Bonanno et al., 2010; Kessler et al., 2012). Moreover, our sample closely matched Chilean census benchmarks, strengthening population-based inferences and increasing the generalizability of our findings.

Rapid succession disaster sequences are common yet under-explored in the extant literature (Kessler et al., 2012); the present study addressed this absence and explored the relationship between rapid succession disaster exposure and subsequent responses. We found that specific, but not cumulative, exposure to the earthquake and associated disasters (tsunami, looting) was correlated with negative outcomes. Second, cumulative counts of and specificity in exposure to secondary stressors were both associated with adverse psychological outcomes. Lastly, several demographic predictors elucidated variability in postdisaster responses.

Type of Trauma Exposure

Results advance our understanding of differential effects of exposure to different types of traumatic events. Contrasting results from Tables 4 and 5 highlight the importance that disaster type has on distress responses. Distress was more strongly associated with the specific type (i.e., the tsunami; see Table 4)—rather than with the number (see Table 5)—of disaster components experienced. Although the prevalence of PTSD after natural disasters is typically lower than that occurring after man-made or technological disasters (Norris et al., 2002), prior research has not explored natural disasters compounded by human errors. Results indicated that exposure to the destructive tsunami, occurring despite assurances from the government that the coastal area was safe, had an independent contribution to deleterious outcomes. Negative psychological outcomes have been observed following traumatic events that were another person's fault (Delahanty et al., 1997); disasters (such as the tsunami) that stem from or are exacerbated by large-scale failures of trusted authorities may be detrimental by a similar process. Our findings thus support theoretical models positing disasters caused or worsened by human failings may elicit greater distress (Baum, 1987). Interestingly, exposure to the looting was not correlated with increased PTS or global distress and was negatively correlated with functional impairment (see Table 4). Perhaps for those who either personally participated in the looting or who knew a friend or family member who did so, the looting instilled a sense of control in an otherwise uncontrollable situation; greater sense of control has been linked with more adaptive functioning (Folkman, 1984).

Results indicate that exposure to specific *types* of individual-level secondary stressors independently predicts distress (see Table 4). More specifically, experiencing injury after the Bío Bío disaster was more strongly associated with negative outcomes than was experiencing property loss or knowing someone who died. In a related vein, the majority of the disaster-related deaths were caused by the tsunami. Taken together, these findings bolster theories postulating that threat to life, perhaps even more so than loss, drives the emergence of PTS symptoms (Momartin, Silove, Manicavasagar, & Steel, 2004). The looting was also human-perpetrated, but it could not be blamed on a single organization, and the participation of many community members in the looting may have weakened the link between exposure to the looting and negative outcomes.

Cumulative Exposure to Traumatic Events

As illustrated in Table 5, the cumulative number of disaster exposures (earthquake, tsunami, looting) was not associated with negative outcomes. However, cumulative exposure to (i.e., experiencing greater numbers of) individual-level secondary stressors (property loss, injury, and death) was significantly associated with PTS, global distress and functional impairment. The latter finding supports a growing body of research demonstrating that increased exposure to negative life events tends to correlate with subsequent adverse physical and mental health outcomes (e.g., Chapman et al., 2004; Felitti et al., 1998). Postdisaster screenings, clinical intakes, and research endeavors should assess both type and amount of trauma exposure to help identify survivors who might be most at risk for problems.

Individual-Level Characteristics

Several person-level characteristics were linked with negative outcomes. Females were more at risk for psychological problems, as expected (Norris et al., 2002; van Griensven et al., 2006). In contrast to previous findings (Norris et al., 2002), however, middle age and older adults were more susceptible to negative outcomes following the earthquake and its aftermath, highlighting the benefit of nuanced conceptualizations of age effects that consider type of outcome measure (Scott et al., 2013). Lower SES was strongly related to negative outcomes, bolstering growing research linking SES and postdisaster mental health (Garfin & Silver, in press) and identifying an additional population segment to target for interventions. Findings were also consistent with substantial literature linking past mental health problems with postdisaster maladies (Garfin & Silver, in press). Outreach with this population may be particularly important: people with a history of poor mental health are at greater risk for postdisaster distress, yet are also more likely to stop psychological treatments, exacerbating existing problems (Wang et al., 2008).

Cultural Concerns

Short-term epidemiological postdisaster mental health assessments of representative samples, especially those in non-Western nations, are limited. South America's Pacific Coast is particularly vulnerable to devastating earthquakes; six of the 12 strongest earthquakes have occurred in this region, with Chile experiencing some of the strongest (U.S. Geological Survey, 2013b). Yet few postdisaster studies are conducted in Pacific Latin America; to our knowledge, no prior studies have used epidemiological data to examine reactions to earthquakes there. Possible cross-cultural differences in response to traumatic events highlight the value of conducting international research to understand region-specific reactions, as North American and European models of trauma assessments and interventions do not necessarily translate directly to all cultures (Draguns & Tanaka-Matsumi, 2003). Indeed, rates of psychiatric disorders vary greatly among epidemiological studies in Latin America; for example, Chileans reported lower rates of both trauma exposure and PTSD compared to Mexicans (Zlotnick et al., 2006). Whereas reexperiencing and arousal symptoms of PTS appear to be biologically derived and thus universally experienced, even within the United States, Latinos tend to report more avoidance symptoms, perhaps due to cultural mores promoting individual subordination to group well-being (Zayfert, 2008). This emphasizes the need for culturally specific prevalence rates of postdisaster psychopathology, which are important for estimating postdisaster service needs in a community.

Our results inform the historical record in this highly seismically active region of Latin America by documenting prevalence rates and examining predictors of psychological distress. Findings suggest that factors that tend to correlate with distress in European contexts (e.g., demographics, prior mental health, threat to life) translate to Latin American contexts. Future research should seek to replicate and expand these results in Latin American and other cultures (e.g., Asian, African) to generate a basis for stronger culturally specific clinical outreach and public policy recommendations.

Appraisals in the Postdisaster Context

Although 5% of participants were at the coast when the tsunami hit, almost 25% reported the tsunami and its subsequent flooding as the worst component of the disaster. The tsunami was associated with the greatest number of deaths and the resulting flood water took several weeks to subside, resulting in severe—and long-lasting—structural damage to the community. Other than having been physically present at the coast, the strongest correlate of endorsing the tsunami as the worst component of the disaster was event-related media exposure, highlighting the importance of media exposure as a predictor of postdisaster distress and the importance of the appraisal process following traumatic events (Janoff-Bulman, 1992). Moreover, results support emerging theories and empirical evidence that starkly contrast traditional views of trauma exposure, suggesting that trauma can be experienced vicariously; media exposure, for example, can be a more powerful predictor of stress responses to collective traumas than direct exposure (Holman et al., 2014).

Over a quarter of participants endorsed looting as the worst component of the disaster, which was associated with higher SES. Past research suggests community members from more economically and socially disadvantaged groups are more likely to participate in crimes following natural disasters (Zaharan, Shelley, Peek, & Brody, 2009). Given this, perhaps wealthier participants (and their friends and family members) refrained from engaging in looting activities. Furthermore, the looting may have challenged participants' former belief in the benevolence or trustworthiness of other community members, a particularly important world view for some (Janoff-Bulman, 1992).

Limitations

Several limitations must be acknowledged. While data were collected in a shorter timeframe than most postdisaster epidemiological research, no assessments occurred within the first month after the earthquake, precluding inferences regarding acute stress reactions. We were also unable to explore change over time. Although we collected data on a sample that was representative of the population from which it was drawn, a portion of those eligible refused the interviews. Nonetheless, our response rate was substantially higher than the 20% typical in face-to-face survey assessments in South America (Jaime Vásquez, personal communication, 2013) and rigorous surveying techniques helped ensure that nonresponse was not primarily a function of degree of exposure to the disaster or demographic characteristics. While the PCL has been validated for use in Spanish, it has not been previously used in epidemiological studies in Chile specifically. Given the link between disaster exposure, reaction to stressors, and physical health problems (Holman et al., 2008), future research should also include objective measures of physical health outcomes. Lastly, because all of our participants were highly exposed to the earthquake, we did not have a no- or low-exposure comparison group, which may have shown disparate patterns of responses (Palinkas, Downs, Petterson, & Russell, 1993).

Conclusions

Findings advance theoretical understandings of postdisaster traumatic stress responses by indicating that specificity in type—rather than only the amount—of trauma exposure predicts variability in distress responses. Assessments that incorporate specific exposures that occur in the context of a larger disaster may improve research, policy, and clinical interventions following community catastrophes. Models that consider cumulative effects of trauma provide gross estimates of how increased trauma exposure may correlate with increased susceptibility to psychiatric maladies (Asarnow et al., 1999). Yet our findings suggest that a more fine-grained approach that considers the *type* of trauma exposure should also be considered, particularly after natural disasters, where it might be advantageous—and feasible—to identify people based on exposure to different events. Policies could target specific neighborhoods or communities with increased psychosocial services according to the component of the disaster sequence most heavily experienced. For example, communities more heavily impacted by disasters with a man-made component or with greater death tolls could be targeted more aggressively with short-term outreach efforts such as Psychological First Aid (Ruzek et al., 2007), and psychiatric screenings could include questions regarding specificity of disaster exposure.

Future research should continue to explore questions relating to both amount and nature of exposures following negative events, as well as the mechanisms (e.g., subjective interpretations, physiological reactions) behind these responses. Mixed methods that incorporate qualitative interviews may be especially useful in future studies. For example, qualitative interviews that ask participants to report *why* they felt one component of the disaster was worse than another may help elucidate psychological processes.

Methodologically, our study provides a model for successfully executing population-based short-term psychological assessments in an international context. Important for traumatic stress theory, results illustrate that postdisaster distress is not merely a function of cumulative exposure to traumatic events and secondary stressors, but is likely to be event- and experience-specific. More broadly, findings indicate appraisal of disaster severity may be influenced by factors such as media exposure and individual-level characteristics such as SES. Finally, targeting population segments based on demographic considerations, disaster experiences, and secondary stressors exposure may facilitate effective distribution of postdisaster services with the hope of informing humanitarian outreach efforts following multifaceted, rapid succession community disasters.

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