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The Influence of Flood Exposure and Subsequent Stressors on Youth Social-Emotional Health

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Abstract

Most disaster mental health research focuses on the relationship between disaster exposure and distress, often neglecting its influence on social-emotional health, despite implications for resilience and well-being post-disaster. Following multiple floods in Texas, a sample of 486 youth aged 10–19 years old (M = 13.74 years, SD = 2.57; 52.9% male) completed measures of disaster exposure, life stressors since the disaster, and social-emotional health. Using mixture regression modeling, we examined differences in the relationship between life stressors and social-emotional health across latent classes of disaster exposure (*High*, *Moderate*, *Community*, and *Low Exposure*). After accounting for mean levels of life stressors, the mean levels of social-emotional health did not differ across exposure classes; however, the strength of the relationship between life stressors and social-emotional health did. Youth in the *High Exposure* group had the highest mean level of life stressors since the disaster. Thus, each additional life stressor did not result in changes in social-emotional health, suggesting saturated stress levels. For youth in the *Moderate* and *Community Exposure* classes, increases in life stressors did lower social-emotional health, perhaps pushing them into stress overload. For the *Low Exposure* group, life stressors did not have an influence. This has implications for post-disaster mental health screening and support, tailored by levels of exposure and attuned to ongoing stressors that may impact long-term social-emotional health.

Keywords

natural disaster; social-emotional health; life stressors; youth

Globally, the increasing frequency and severity of natural disasters and extreme weather events leaves children carrying the heaviest weight of the burden of disease attributable to climate change (American Academy of Pediatrics, 2015). The severity of many natural disasters, such as hurricanes and flooding, has been linked to climate change, and a recent review found that public health and mental health risk for all individuals due to climate change is high (Crimmins et al., 2016). Natural disasters have significant economic and social impact as potent, acute stressors that can involve death or serious injury; loss of property and valued belongings; disrupt daily living for extended periods of time; and cause major alterations in the physical environment. Natural disasters can also set in motion a series of additional life stressors, as families may have increased arguments, experience financial strain, contend with illnesses or physical injuries related to the disaster, move schools/neighborhoods, and/or grieve loved ones (Silverman & La Greca, 2002). Additional

life stressors have been considered as one factor associated with higher rates of psychopathology among disaster-exposed samples compared to non-exposed, but this factor has yet to be examined for its potential influences on social-emotional health, despite the fact that the mechanisms of influence are likely similar.

Meta-analyses of decades of research on the influence of natural disaster exposure on child mental health show disasters are related to increased risk for posttraumatic stress symptoms (Furr, Comer, Edmunds, & Kendall, 2010), other internalizing symptoms, and externalizing symptoms (Rubens, Felix, & Hambrick, 2018). Disasters are also linked to increased absences from school, declines in school performance, missed social opportunities, and possible changes in social support due to moving neighborhoods or schools (Silverman & La Greca, 2002), increased number of medical problems and visits (Felix, Kaniasty, You, & Canino, 2016), and higher risk for sedentary activities (Lai, La Greca, & Llabre, 2014). The life stressors that often happen post-disaster have social impacts as well (Crimmins et al., 2016). However, it is crucial to note that only a minority of even the most highly exposed survivors report serious psychopathology (Bonanno, Brewin, Kaniasty, & La Greca, 2010). Indeed, resilience was one of the most common trajectories found in a review of longitudinal studies of global natural disaster survivors, and merits continued scientific attention (Bonanno et al., 2010).

Although multiple dimensions of youth functioning can be impacted by natural disasters, research has disproportionally focused on symptoms of psychopathology rather than well-being (Rubens et al., 2018). Thus, the impact on social-emotional health, from the positive, as opposed to deficit perspective, has been relatively neglected. To address this gap in the literature, we examined the linkages between disaster exposure, life stressors following the disaster, and social-emotional health for child disaster survivors, grouped by level of disaster exposure. Our first step, in a recent study (Felix et al., in press), was to identify four groups of disaster exposure latent classes that included *High*, *Moderate*, *Community*, and *Low Exposure* groups that were differentially related to depression, anxiety, and posttraumatic stress symptoms. The current study builds upon this prior work, but is distinct in examining the role of life stressors since the disaster and the combined influence of disaster exposure and life stressors on youth social-emotional health.

The Need to Examine a Broad Range of Effects of Disaster Exposure on Child Adjustment

The overwhelming majority of empirical attention in child disaster mental health research has been focused on negative sequelae, primarily focusing on posttraumatic stress disorder (PTSD) symptoms, followed by other internalizing problems, such as depression, and a small, but growing investigation of risk for externalizing symptoms (e.g., aggression, oppositional or defiant behavior; Rubens et al., 2018) and sleep problems (Geng, Fan, Mo, Simandl, & Liu, 2013). A few research teams have begun to draw attention to positive youth outcomes following natural disasters, including sense of community (Bokszczanin, 2012), posttraumatic growth (Felix et al., 2015), and prosocial behavior (Sprague et al., 2015). In one study, youth who experienced mandatory evacuations in the context of wildfire,

displayed more prosocial behavior in the long-term aftermath than youth who lived in the community but were not evacuated from their homes (Sprague et al., 2015). Youth may respond to increased environmental stress related to disaster with stronger efforts towards helping others. The possibility of this and other positive outcomes related to disaster response needs further empirical examination.

Following the Great East Japan Earthquake, Uchida, Takahashi, and Kawahara (2014) cogently argued for differentiating aspects of well-being. They pointed out that negative emotions signify a reduction in hedonic (experience of pleasure) well-being, but that there are other aspects of well-being to consider, such as attitudes toward life, engaging in prosocial behaviors, and commitment to socially-meaningful goals. Among young adults who were not directly impacted by the earthquake, they found that reevaluation of life and connectedness post-disaster were related to general well-being post-disaster, even after controlling for pre-disaster well-being. Similarly, following two major earthquakes in Italy, a study of disaster-exposed youth found that those with greater posttraumatic stress symptoms were more likely to have intentions to be connected to, and help, other survivors (Vezzali, Drury, Versari, & Cadamuro, 2016). In their discussion, the authors suggested that there are aspects of disaster experiences that can serve to build a sense of community, which, in turn, can support well-being.

Taken as a whole, prior research suggests that further investigation is needed on how aspects of the disaster experience, and life stressors in the recovery aftermath, may affect social-emotional health. Although investigations overemphasize the ways in which negative experiences reduce social-emotional health, an important body of research has emerged pointing to the possibility that negative experiences may prompt internal and community changes that lead to improvements in some aspects of social-emotional health.

Social-Emotional Health

The study of social-emotional health builds from a positive psychology perspective and the study of assets or developmental resources among youth, which contribute to positive or healthy outcomes (Scales, Benson, Leffert, & Blyth, 2000). These social-emotional factors can be understood within a transactional ecological model that allows for a holistic examination of the interacting systems impacting youth and family social-emotional health and risk (Bronfenbrenner & Morris, 2006; Kia-Keating, Dowdy, Morgan, & Noam, 2011). After disaster, the interactions and transactions that take place over time create a reciprocal and dynamic cycle that shapes individual outcomes (Weems & Overstreet, 2008). Furthermore, understanding of social-emotional health indicators can provide potential clinical implications regarding assets that can be shaped and enhanced to help support well-being among children and families following disaster.

In particular, assets that can foster youth development include a sense of self-efficacy, deriving social support from others, emotional competence in terms of empathy and emotional regulation, and attitudes such as optimism, gratitude, and zest (Fredrickson, Tugade, Waugh, & Larkin, 2003; Furlong, You, Renshaw, Smith, & O'Malley, 2014). Social support can play an especially important role in well-being, and can lower levels of

psychopathology following disaster exposure (La Greca, Silverman, Vernberg, & Prinstein, 1996; Norris et al., 2002). After facing natural disasters, the social-emotional capacities of youth to draw on resources, manage their emotions, and maintain optimism can benefit them over time, as these assets impact the transactions they have with each socio-ecological system that they encounter, including family, peers, mentors, schools, and community and religious resources, and ultimately, promote well-being (Kia-Keating et al., 2011; Scales et al., 2000).

Current Study

There is a need to understand the impact of natural disasters on indices of adjustment that are not simply psychopathological and deficit-focused. The current study helps to fill this gap by exploring the impact of disaster exposure and life stressors since the disaster, on four components of social-emotional health: *Belief-in-Self*, *Belief-in-Others*, *Emotional Competence*, and *Engaged Living*. We chose these domains of social-emotional health because of prior research exploring them as critical components of complete mental health in youth (Furlong et al., 2014). This will be the first time, to our knowledge, that they have been studied in a disaster context. This study builds upon prior work which has used latent class analysis (LCA) to group survivors based on specific disaster exposure experiences. Specifically, (Felix et al., in press) examined different analytic approaches to measuring disaster exposure, finding LCA to be one valuable approach to understanding individual exposure experiences. The LCA found that the experiences of youth and parents exposed to floods were best captured through a 4-class latent class model made up of *High Exposure*, *Moderate Exposure*, *Community Exposure*, and *Low Exposure.* In the current study, we build on these research findings by addressing the following, novel research questions (RQ):

RQ1. What are the mean differences in life stressors and social-emotional health across these disaster exposure groups?

RQ2. For different groups of disaster survivors (latent classes), how do life stressors influence social-emotional health? Specifically, are there mean differences (intercept differences) across the disaster exposure groups in social-emotional health when accounting for the influence of life stressors? How does the strength of the relationship (slopes) between stressors and social-emotional health compare across disaster exposure groups?

Method

Participants and Procedures

Participants were youth aged 10–19 years old who were recruited, together with their parents, to complete an online survey following multiple flood disasters in Texas. Recruitment began in October 2015, following Institutional Review Board (IRB) approval granted by Human Subjects Committee, University of California Santa Barbara, #8–16-0922, Parent-Child Process Affecting Long Term Post-Disaster Psychosocial Adjustment.

Between May 2015 and May 2016, the state of Texas experienced six major flood and severe weather disasters, as declared by the Federal Emergency Management Association (FEMA), which overall affected 62.5% (159) of all counties in the state. As such, over the course of recruitment, devastating floods continued to occur. Considering that families could have been affected by multiple floods, and in order to minimize participant time and survey fatigue, the IRB approval was modified so as not to ask exposure questions repeatedly after each flood. Participants were instead asked to indicate which of the following floods was most stressful to them (i.e., "Memorial Day Weekend 2015," "Halloween Weekend 2015," "April 2016", or "Other, please specify which flood"), and then complete the online survey items using their most stressful flood as the focal point. Recruitment methods included flyers, electronic newsletters, door-to-door recruitment, social media advertising, telephone recruitment, and an opt-in panel. Recruitment ended in March 2017. After completing the survey, all participants were given a small incentive for their time. Per parents, the average time since focal disaster at survey completion was 406.33 days ($SD = 162.79$). Additional details on recruitment and procedures can be found in (Felix et al., in press).

A total of 510 youth completed the online survey. However, 24 youth who reported their most stressful flood experience as "other" were excluded from the sample because of the wide range of past floods reported outside the one-year time range under study (e.g., a 2010 flood, Hurricane Katrina, none were stressful, etc.). The final sample included 486 youth whose most stressful flood was one of six which occurred in Texas between May 2015 and May 2016. Participants were 52.9% male and their mean age was 13.74 years ($SD = 2.57$). Their ethnicity was 57.2% White, 18.8% Latinx, 9.0% African American, 7.9% Asian/ Pacific Islander, 1.0% Native American, and 6.1% Mixed (two or more races). In comparison, United States Census data adjusted for 2016 showed that the general population in Texas was 42.6% White (not Hispanic), 39.1% Latinx, 12.6% African American, 4.8% Asian, 0.1% Pacific Islander, and 1.0% Native American. Parents reported a median family income of $60,001-$70,000.

Measures

Flood exposure.—Flood exposure for the focal disaster determined by youth was measured using a Flood Impact Questionnaire (FIQ), which was developed from previously established measures of disaster exposure (Felix et al., 2011; La Greca et al., 1996), with a few additional flood impact questions obtained from a study of the 1993 Midwest Floods (Ginexi, Weihs, Simmens, & Hoyt, 2000). Youth answered 10 items that asked about loss or damage to their home and belongings, school, and places that they go for fun; feeling afraid; getting sick or injured; knowing someone who got sick, injured, or killed; and having an animal that got lost, hurt, or killed as a result of the flood. Response options were $0 = no$, $1 = yes$. One item asking about damage to home and belongings was answered on a 5-point scale from $0 = No\ Damage$ to $4 = Total\ Loss\ or\ Destruction$. Responses were then converted to a dichotomous scale ($0 = No\ Damage$, $1 = Any\ Damage$) following a descriptive analysis demonstrating that these two groups distinguished between mental health outcomes.

Life stressors since the flood.—Youth were also asked if they had experienced different stressful life events (life stressors) in the months since the flood that was most

stressful to them. Items (9) were adapted from questions used in prior research following wildfire disasters (e.g., Freedy, Kilpatrick, & Resnick, n.d.; Felix et al., 2015). Items asked about change of schools, moving away, illness or injury to self or a family member, money problems, relationship problems, and arguments with siblings or parents. Response options were 0 = *no*, 1 = *yes*. A total score was computed by the sum of the dichotomized items.

Social-emotional health.—Social-emotional health was measured using the Social and Emotional Health Survey (SEHS; Furlong et al., 2014). The SEHS is a 36-item, empirically-derived questionnaire designed to assess key aspects of positive youth development. The instrument measures four positive mental health domains, each consisting of three 3-item subscales. *Belief-in-Self* involves self-awareness (e.g., "I understand my moods and feelings"), self-efficacy (e.g., "I can work out my problems"), and persistence (e.g., "I try to answer all the questions asked in class"). *Belief-in-Others* includes family coherence (e.g., "There is a feeling of togetherness in my family"), peer support (e.g., "I have a friend my age who really cares about me"), and school support (e.g., "At my school, there is a teacher … who always wants me to do my best"). *Emotional Competence* includes emotion regulation (e.g., "I can deal with being told no"), empathy (e.g., "I try to understand what other people go through"), and self-control (e.g., "I think before I act"). *Engaged Living* includes optimism (e.g., "I usually expect to have a good day"), gratitude (e.g., "Since yesterday, how much have you felt grateful?"), and zest (e.g., "How much do you feel lively right now?"). These four traits in turn contribute to a single second-order meta-construct of social-emotional health, found to be significantly related to youth psychosocial outcomes such as academic achievement, school safety, depressive symptoms, and substance use (Furlong et al., 2014). The SEHS items (except the ones on gratitude and zest) were answered on a 4-point scale from 1 = *not at all true of me* to 4 = *very much true of me*. The items on gratitude and zest were answered on a 5-point scale from 1 = *not at all* to 5 = *extremely*, as they refer to frequency of experience. For the current study, responses were averaged to create mean composite scores for the four major domains. The SEHS has previously demonstrated strong construct validity with full factorial invariance across males and females, younger and older adolescents, and five different sociocultural groups (Furlong et al., 2014; You et al., 2014; You, Furlong, Felix, & O'Malley, 2015). Previous research has also found that this measure has good internal consistency reliability both for the total index (α = .92; Furlong et al., 2014) and the four second-order traits (You et al., 2014). The current sample showed α = .85 for *Belief-in-Self*, α = .85 for *Belief-in-Others*, α = .88 for *Emotional Competence*, and α = .90 for *Engaged Living*.

Data Analysis Plan

The latent class model used in the current study was based off of previous work identifying the best-fitting model for youth flood exposure (Felix et al., in press). In line with best practices for latent class model enumeration and selection (Masyn, 2013), models with one to six classes were enumerated and evaluated on a number of fit indices, resulting in a final four-class model: *High Exposure, Moderate Exposure, Community Exposure*, and *Low Exposure.* The *High Exposure* class (10%) reported the greatest extent of flood exposure, with more than 60% chance of endorsing eight of the ten exposure items. This *High Exposure* group was more likely than the other groups to endorse feeling afraid they would

die in the flood, having someone close to them get sick or injured in the flood, and having an animal lost, hurt, or killed as a result of the flood. Even though the probability for endorsing knowing someone who was killed in the flood was below 50% for all groups, it was highest for the *High Exposure* class. The *Moderate Exposure* class (28%) endorsed half of the exposure items at greater than 50% probability, indicating they experienced temporary displacement from their homes, and moreover, that their schools, areas of entertainment, homes, and items of value were impacted by the flood. The *Community Exposure* class (34%) indicated their schools, areas of entertainment, and homes were affected by the flood. Youth in the *Moderate Exposure* class were more likely to endorse having their homes or belongings damaged in the flood, losing important belongings, and having to temporarily move due to the flood than the *Community Exposure* class. Youth in the class labeled *Low Exposure* (28%) had a low probability of endorsing any of the flood exposure items.

The primary pursuit of the current study was to understand the differential effects of life stressors on social-emotional health, given extent of disaster exposure, as determined by participants' disaster exposure latent class membership. To fully understand the relationships between these three domains (life stressors, disaster exposure latent class membership, and social-emotional health), the relationship between each pair of domains was examined first, before analyzing all three together. To do so, the impact of disaster exposure class membership on both social-emotional health and subsequent life stressors was examined with M*plus* version 8 (Muthén & Muthén, 2017) using the automatic BCH method (Asparouhov & Muthén, 2015), a method which avoids class-shifting despite the addition of auxiliary variables into the latent class model. Using this method provides a baseline to help understand if there are meaningful differences across the emergent disaster exposure classes with respect to social-emotional health and life stressors. Additionally, the direct relationship between life stressors and social-emotional health was examined in SPSS 24 using linear regression.

Finally, mixture regression modeling was used to test the impact of life stressors (grand-mean centered) on social-emotional health, conditioned on their disaster exposure latent class membership. This approach allowed us to examine the relationship between life stressors since the disaster on social-emotional health, within each disaster exposure group. This can be thought of as allowing the disaster exposure groups (latent classes) to moderate the relationship between life stressors since disaster on social-emotional health. In performing the mixture regression model, the manual three-step approach was utilized in M*plus* (Nylund-Gibson, Grimm, Quirk, & Furlong, 2014). The three-step approach avoids shifts in latent classes when including auxiliary variables and can be used when the model includes both predictor *and* outcome variables (Asparouhov & Muthén, 2014; Nylund-Gibson et al., 2014; Vermunt, 2010). To test if there was a moderating effect, post-hoc analyses (specifically, Wald tests) were utilized to test for significant differences between disaster class-specific means of the outcome social-emotional health (intercepts), as well as the class-specific slopes of the relationship between life stressors and social-emotional health.

Results

Descriptive Analyses

Table 1 displays Pearson correlations, means, and standard deviations for the study variables. As expected, the four main SEHS constructs were significantly correlated with each other ($r = .55$–$.70$, $p < .001$). In addition, results indicated that there was a significant positive correlation between life stressors and a sum score of flood exposure ($r = .57$, $p < .001$), such that youth who experienced greater flood exposure also reported more life stressors since the flood. Greater total flood exposure was also significantly, positively correlated with only one of the SEHS constructs, *Engaged Living* ($r = .14$, $p = .002$). Bivariate correlations for the three smaller subscales comprising *Engaged Living* revealed that, in particular, greater flood exposure was significantly related to higher levels of gratitude ($r = .13$, $p = .004$) and zest ($r = .16$, $p = .001$). Greater number of life stressors since the flood was significantly related to lower levels of *Belief-in-Self* ($r = -.11$, $p = .017$) and *Emotional Competence* ($r = -.14$, $p = .002$).

Gender and ethnic differences for flood exposure, life stressors, and social-emotional health were explored using independent samples *t*-tests and ANOVAs, with Bonferroni correction ($p < .008$) to account for the multiple comparisons. Overall, there were no significant differences by gender or ethnicity, with the exception of the SEHS construct for *Belief-in-Others*. Females ($M = 3.50$) reported significantly higher levels of *Belief-in-Others* than did males ($M = 3.36$), $t(479) = 3.15$, $p = .002$. To examine significant differences in income across classes, income level was transformed into a binary variable (high/low) using a median split, and pairwise Wald tests were utilized to test for significant differences, none of which were found.

Disaster Exposure Latent Classes Predicting Life Stressors and Social-Emotional Health

To answer RQ1, we examined the relationship between disaster exposure latent classes (herein referred to as disaster exposure groups) and social-emotional health and life stressors (see Figure 1). Consistent with the correlational findings when flood exposure was treated as a sum score, the membership in a disaster exposure group did not significantly differentiate children's scores on *Belief-in-Self, Belief-in-Others,* or *Emotional Competence*. However, disaster exposure did significantly differentiate between participant scores on *Engaged Living* ($p < .01$), whereby youth who were in the *High Exposure* group had significantly greater *Engaged Living* scores ($M = 3.94$, $SD = 0.09$) compared to youth in the *Community Exposure* group ($M = 3.58$, $SD = 0.07$, $p = .001$) and the *Low Exposure* group ($M = 3.57$, $SD = 0.07$, $p = .001$). *Engaged Living* scores for youth in the *Moderate Exposure* group ($M = 3.74$, $SD = 0.06$) were not significantly different from scores of youth in any of the other disaster exposure groups.

The average number of life stressors were all significantly different from one another across the disaster exposure classes ($p < .001$ for all *High Exposure* class comparisons, $p < .001$ for *Moderate* vs. *Low Exposure*, $p = .003$ for *Moderate* vs. *Community Exposure*, and $p = .001$ for *Community* vs. *Low Exposure*). Youth in the *High Exposure* class experienced the highest level of life stressors ($M = 4.46$, $SD = 0.37$), followed by youth in the *Moderate*

Exposure class ($M = 2.01$, $SD = 0.18$), *Community Exposure* class ($M = 1.28$, $SD = 0.14$), and finally, the *Low Exposure* class ($M = 0.58$, $SD = 0.13$).

Comparing SEHS across Disaster Exposure Classes Accounting for Life Stressors

The mixture regression was estimated for each disaster exposure group while accounting for measurement error in latent class membership (see Figure 2). To understand results of the mixture regression model, we focused first on interpreting mean differences (intercept differences) in SEHS across the disaster exposure groups, while accounting for the influence of life stressors. Next, we interpreted the differences in slopes (strength of the relationship) between life stressors and SEHS across disaster groups.

Comparisons of adjusted means.—Mean levels of social-emotional heath did not differ across exposure classes when accounting for the effect of life stressors on social-emotional health. The differences in *Engaged Living* that were observed without accounting for life stressors, were no longer significant when accounting for life stressors.

Comparisons of slopes.—Focusing on the slopes, results showed that there was a conditional effect of life stressors on social-emotional health. Specifically, for the *High Exposure* group additional increases in life stressors, beyond their already high mean levels of life stressors, did not significantly deteriorate any of the domains of social-emotional health. This indicates a possible saturation level, where stress is already high, so that additional increases no longer produce a change in outcomes. Within the *Moderate Exposure* group, additional increases in life stressors were associated with significant decreases in *Belief-in-Self* ($\beta_1 = -.09$, $p = .004$), *Belief-in-Others* ($\beta_1 = -.07$, $p = .008$), and *Emotional Competence* ($\beta_1 = -.09$, $p = .002$), but not *Engaged Living*. For the *Community Exposure* group, more life stressors significantly deteriorated *Emotional Competence* ($\beta_1 = -.10$, $p = .002$), but did not affect the other subdomains of social-emotional health. Lastly, for the *Low Exposure* group, increases in life stressors did not significantly affect any subdomain of social-emotional health.

Comparing slopes across exposure groups.—Tests of differences in slopes across class membership suggested that the strength of association between life stressors and the social-emotional health domains of *Belief-in-Self* and *Emotional Competence* significantly varied based on disaster exposure class membership. Specifically, membership in the *High Exposure* and *Community Exposure* groups was associated with a non-significant positive relationship between life stressors and *Belief-in-Others*. The strength of these relationships was significantly different from the negative relationship between life stressors and *Belief-in-Others* for youth in the *Moderate Exposure* group (*High Exposure* vs. *Moderate Exposure*, $p = .023$; *Community Exposure* vs. *Moderate Exposure*, $p = .049$). Youth in the *Low Exposure* group also had a non-significant negative relationship between life stressors and *Belief-in-Others*, but the strength of the relationship was not significantly different from the other groups. Similar to *Belief-in-Others*, youth in the *High Exposure* group had a non-significant positive association between life stressors and *Emotional Competence*, and the strength of the relationship was significantly different from that of youth in the *Moderate Exposure* ($p = .042$) or *Community Exposure* ($p = .025$) groups, for whom life stressors

were negatively associated with *Emotional Competence*. Lastly, the strength of the relationship between life stressors and *Emotional Competence* for youth in the *Low Exposure* group was not significantly different compared to youth in any of the other groups of disaster exposure.

Discussion

When examining posttraumatic stress symptoms, there are multiple trajectories of outcomes for youth following natural disaster exposure, including resilient, recovering, and chronic distress groups (Bonanno et al., 2010; La Greca et al., 2013; Self-Brown, Lai, Thompson, McGill, & Kelley, 2013). Research has shown that trajectory type is impacted by social support, emotion regulation, additional life stressors (La Greca et al., 2013; Self-Brown et al., 2013), and family/community violence exposure (Self-Brown et al., 2013). A review of the literature supports that resilience is a common trajectory post-disaster (Bonanno et al., 2010). Despite acknowledging the option of post-disaster resilience, only a handful of studies have begun to explore outcomes other than distress (Felix et al., 2015; Sprague et al., 2015; Uchida et al., 2014). Research and theoretical work acknowledge that mental health is more than just the absence of symptoms (e.g., Keyes et al., 2012), and research needs to address aspects of social-emotional health. In this study, we explored the relationship among different disaster exposure groups, life stressors since the disaster, and four aspects of social-emotional health: *Belief-in-Self*, *Belief-in-Others*, *Engaged Living*, and *Emotional Competence.* We found different patterns based on exposure group for social-emotional health outcomes and the impact of post-disaster life stressors on social-emotional health.

Youth with the greatest amount of flood exposure also contended with the highest mean level of life stressors since the disaster. In fact, their mean level of life stressors was twice as high as the next highest level (*Moderate Exposure*) and almost four times as high as the *Low Exposure* group. They experienced the highest levels, compared to other exposure groups, of *Engaged Living,* which is comprised of current self-ratings of gratitude, zest, and optimism. Our previous research with this *High Exposure* group found that they also reported the highest levels of posttraumatic stress, depression, and anxiety symptoms compared with peers who experienced lower levels of flood exposure (Felix et al., in press). It could be that the experience of the disaster, and subsequent life stressors, increased emotion activity in these youth, for both positive and negative emotions. An implication for disaster mental health research is that it needs to explore complete mental health (e.g., Keyes et al., 2012; Moore et al., 2015) among disaster survivors, as well as the reciprocal exchange between distress and positive emotions. It could be that youth were trying to make situational meaning of their disaster experience (Park, 2014) and this contributed to levels of gratitude, zest, and optimism. Complete mental health investigation can help identify what factors help support post-disaster resilience, and provide fuller understanding of the trajectory of post-disaster mental health and well-being outcomes (de Milliano, 2015).

Once life stressors were considered, there were no longer differences in social-emotional health by disaster exposure group. However, examining the strength of the relationship between life stressors and social-emotional health by disaster exposure group provided a more complete picture of the associations between exposure, stressors, and social-emotional

health. Focusing on the slopes, results demonstrated a conditional effect of life stressors on social-emotional health. For the *High Exposure* group, additional increases in life stressors did not significantly deteriorate any of the domains of social-emotional health. It is possible that a ceiling or saturation level exists, whereby stress has reached a level at which additional increases no longer produce a change in outcomes. In contrast, for the *Moderate Exposure* group, additional increases in life stressors were associated with significantly lower levels of *Belief-in-Self*, *Belief-in-Others*, and *Emotional Competence*, but not *Engaged Living*. Likewise, for the *Community Exposure* group, more life stressors were associated with significantly lower *Emotional Competence* but were not related to other subdomains of social-emotional health. Lastly, for the *Low Exposure* group, increases in life stressors did not have a significant association with any subdomain of social-emotional health.

Thus, findings indicated that post-disaster life stressors were not related to the social-emotional health of youth with no or low disaster exposure. However, for those with moderate levels of disaster exposure, endorsement of post-disaster life stressors was significantly related to deteriorated social-emotional health. Life stressors and other traumatic experiences in the aftermath of disaster are known to differentiate trajectories of post-disaster distress among youth (La Greca et al., 2013; Self-Brown et al., 2013). Findings reported here support monitoring those youth moderately exposed to disasters in order to gain understanding of what factors may moderate or protect them, particularly in the context of the accumulation of additional life stressors, to support their well-being and social-emotional health in the long-term aftermath.

Comparing the direction of the relationship between life stressors and social-emotional health across disaster exposure groups revealed interesting differences. For the *High Exposure* and *Community Exposure* groups, although there was no significant relationship between life stressors and *Belief-in-Others*, its direction was positive. However, the *Moderate Exposure* group had a significant, negative relationship between life stressors and *Belief-in-Others*. Although those in the *Moderate Exposure* group were contending with several disaster experiences and life stressors, they may not have received the social acknowledgement and additional support that the *High Exposure* group did, which may account for the negative relationship to *Belief-in-Others*. Kaniasty and Norris (1995) noted that post-disaster social support tends to be given according to relative need, with those with the greatest need receiving the most support. The *Community Exposure* group may not have experienced enough stress to have a relationship to *Belief-in-Others*.

The *High Exposure* group had a non-significant, positive relationship between life stressors and *Emotional Competence*, whereas for the *Moderate* and *Community Exposure* groups, life stressors had a negative relationship to *Emotional Competence*. The youth in the *High Exposure* group may have felt the need to "hold it together" for their family, as they were contending with so much. Indeed, a prior study found that youth with greater disaster exposure reported more prosocial behavior than youth with less disaster exposure (Sprague et al., 2015).

In sum, of all SEHS domains, only *Engaged Living* scores were significantly different across the disaster exposure groups. Additionally, average level of life stressors significantly differed across disaster exposure groups. The *High Exposure* group was contending with both the greatest amount of flood exposure and life stressors since the disaster, and experienced the highest levels of *Engaged Living*. For both the *High* and *Low Exposure* groups, there were not any additional deteriorations in SEHS subdomains on top of flood exposure, and their respective mean levels of life stressors. However, this is not the case for the *Moderate* and *Community Exposure* groups, where differences did exist for additional life stressors. Finally, the direction of the relationship between life stressors and social-emotional health also varied by exposure group.

Implications for Research and Practice

In order to truly understand the range of youth outcomes post-disaster, it is important for researchers to move beyond focusing predominantly on posttraumatic stress, depression, and anxiety symptoms and to investigate other aspects of well-being. Although understanding what factors contribute to post-disaster distress has been critical to building the foundation for evidence-informed disaster response services, we now need research to provide a more holistic picture of the developmental impacts of disaster. The current study supports the influence of disaster exposure experiences and life stressors since the disaster on aspects of social-emotional health in a nuanced way. This kind of work needs replication across disasters and with a variety of ages and culturally diverse samples. Future longitudinal research can help to discern how social-emotional health and distress influence each other over time.

These findings also have potential implications for post-disaster mental health screening efforts, in considering the role of life stressors since the disaster. This study, in combination with our other research efforts from the larger study (Felix et al., In Press), supports the potential utility for post-disaster mental health screening efforts to identify youth who may need additional supports to maintain social-emotional health and contend with the life stressors that often occur at higher rates post-disaster. Our previous research has supported the need to identify and offer appropriate interventions for the *High Exposure* group (Felix et al., in press). By exploring social-emotional health, the current study also points to the importance of screening and intervening to support youth experiencing *Moderate* and *Community* levels of exposure, as they become increasingly vulnerable to deteriorations in social-emotional health when life stressors since the disaster accumulate. Thus, regular monitoring of those youth can help determine if and when additional support may need to be provided.

Finally, given the important role of *Engaged Living,* and particularly, gratitude and zest, future research should examine the role of disaster exposure in impacting these elements. Given the multitude of scientific literature that supports the benefits of positive thinking for mental health, researchers and practitioners may want to determine ways to best capitalize on youth potential for positive thinking in the context of disaster recovery, particularly for those who have had the most severe levels of exposure (Layous, Chancellor, & Lyubomirsky, 2014).

Strengths and Limitations

This study addressed a gap in child disaster mental health research by focusing on how disaster exposure and life stressors since the disaster influence areas of social-emotional health. A relatively large sample of youth provided information on multiple aspects of social-emotional health. Despite these strengths, there are limitations to note. This study is self-report only and cross-sectional. It could be useful to get parent and teacher ratings of social-emotional health and to examine outcomes over time, particularly in order to distinguish between their clinical and practical significance. Research on post-disaster trajectories of distress could be replicated with social-emotional health as the outcome, to better understand the long-term impact of disaster. The sample of youth may not be representative of others who have experienced floods, and may not generalize to other disaster survivors. Our study occurred about a year after the focal disaster, participants were exposed to multiple, severe floods on a regular basis, and results could be different in the short-term aftermath or over an extended period of time.

This study joins other research (e.g., Uchida et al., 2014) in moving our field to examine aspects of post-disaster well-being. We have made recommendations about post-disaster mental health screening efforts based on the results of this study and our larger body of work in this area. However, we must acknowledge that systematic post-disaster mental health screenings to inform supportive services are not yet a regular practice. Consequently, we advocate for their possible utility in better targeting and informing our post-disaster interventions in the short- and long-term. Mental health screening efforts should focus on disaster exposure, life stressors since the disaster, indices of distress, and of course, areas of social-emotional health. In this way, we can better guide our efforts to support the complete well-being of youth exposed to disasters.

References

American Academy of Pediatrics. (2015). Global climate change and children's health: Council on Environmental Health. Pediatrics, 136, 992–997. Retrieved from: http://pediatrics.aappublications.org/content/136/5/992 [PubMed: 26504130]

Asparouhov T, & Muthén B (2014). Auxiliary variables in mixture modeling: Three-step approaches using Mplus. Structural Equation Modeling: A Multidisciplinary Journal, 21, 329–341. doi:10.1080/10705511.2014.915181

Asparouhov T, & Muthén B (2015). Auxiliary variables in mixture modeling: Using the BCH method in Mplus to estimate a distal outcome model and an arbitrary secondary model. Retrieved April 20, 2017, from https://www.statmodel.com/examples/webnotes/webnote21.pdf

Bokszczanin A (2012). Social support provided by adolescents following a disaster and perceived social support, sense of community at school, and proactive coping. Anxiety, Stress, & Coping: An International Journal, 25, 575–592. doi:10.1080/10615806.2011.622374

Bonanno GA, Brewin CR, Kaniasty K, & La Greca AM (2010). Weighing the costs of disaster: Consequences, risks, and resilience in individuals, families, and communities. Psychological Science in the Public Interest, 11, 1–49. doi:10.1177/1529100610387086 [PubMed: 26168411]

Bronfenbrenner U, & Morris PA (2006). The bioecological model of human development In Lerner RM & Damon W (Eds.), Handbook of child psychology: Theoretical models of human development (Vol. 1, 6th ed., pp. 793–828). Hoboken, NJ: John Wiley & Sons Inc. doi:10.1002/9780470147658.chpsy0114

Crimmins A, Balbus J, Gamble JL, Beard CB, Bell JE, Dodgen D, … Ziska L (2016). Executive Summary In Crimmins et al. (Eds.), The impacts of climate change on human health in the United

States: A scientific assessment (pp. 1–24). Washington, DC: U.S. Global Change Research Program. doi:10.7930/J00P0WXS

de Milliano CWJ (2015). Luctor et emergo, exploring contextual variance in factors that enable adolescent resilience to flooding. International Journal of Disaster Risk Reduction, 14, 168–178. doi:10.1016/j.ijdrr.2015.07.005

Felix ED, Afifi T, Kia-Keating M, Brown L, Afifi W, & Reyes G (2015). Family functioning and posttraumatic growth among parents and youth following wildfire disasters. American Journal of Orthopsychiatry, 85, 191–200. doi:10.1037/ort0000054 [PubMed: 25822609]

Felix ED, Binmoeller C, Nylund-Gibson K, Benight CC, Benner A, & Terzieva A (In Press). Addressing disaster exposure measurement issues with latent class analysis. Journal of Traumatic Stress.

Felix ED, Hernández LA, Bravo M, Ramírez R, Cabiya J, & Canino G (2011). Natural disaster and risk of psychiatric disorders in Puerto Rican children. Journal of Abnormal Child Psychology, 39, 589–600. doi:10.1007/s10802-010-9483-1 [PubMed: 21234796]

Felix ED, Kaniasty K, You S, & Canino G (2016). Parent-child relationship quality and gender as moderators of the influence of hurricane exposure on physical health among children and youth. Journal of Pediatric Psychology, 41, 73–85. doi:10.1093/jpepsy/jsv038 [PubMed: 25979084]

Fredrickson BL, Tugade MM, Waugh CE, & Larkin GR (2003). What good are positive emotions in crisis? A prospective study of resilience and emotions following the terrorist attacks on the United States on September 11th, 2001. Journal of Personality and Social Psychology, 84, 365–376. doi:10.1037/0022-3514.84.2.365 [PubMed: 12585810]

Freedy JR, Kilpatrick DG, & Resnick HS (n.d.). The psychological impact of the Oakland Hills Fire: Final report. Charleston, SC: Medical University of South Carolina.

Furlong MJ, You S, Renshaw TL, Smith DC, & O'Malley MD (2014). Preliminary development and validation of the Social and Emotional Health Survey for secondary school students. Social Indicators Research, 117, 1011–1032. doi:10.1007/s11205-013-0373-0

Furr JM, Comer JS, Edmunds JM, & Kendall PC (2010). Disasters and youth: A meta-analytic examination of posttraumatic stress. Journal of Consulting and Clinical Psychology, 78, 765–780. doi:10.1037/a0021482 [PubMed: 21114340]

Geng F, Fan F, Mo L, Simandl I, & Liu X (2013). Sleep problems among adolescent survivors following the 2008 Wenchuan earthquake in China: A cohort study. Journal of Clinical Psychiatry, 74, 67–74. doi:10.4088/JCP.12m07872 [PubMed: 23419228]

Ginexi EM, Weihs K, Simmens SJ, & Hoyt DR (2000). Natural disaster and depression: A prospective investigation of reactions to the 1993 Midwest Floods. American Journal of Community Psychology, 28, 495–518. doi:10.1023/A:1005188515149 [PubMed: 10965388]

Kaniasty K, & Norris FH (1995). In search of altruistic community: Patterns of social support mobilization following hurricane Hugo. American Journal of Community Psychology, 23, 447–477. doi: 10.1007/BF02506964 [PubMed: 8546107]

Keyes CLM, Eisenberg D, Perry GS, Dube SR, Kroenke K, & Dhingra SS (2012). The relationship of level of positive mental health with current mental disorders in predicting suicidal behavior and academic impairment in college students. Journal of American College Health, 60, 126–133. doi:10.1080/07448481.2011.608393 [PubMed: 22316409]

Kia-Keating M, Dowdy E, Morgan ML, & Noam GG (2011). Protecting and promoting: An integrative conceptual model for healthy development of adolescents. Journal of Adolescent Health, 48, 220–228. doi:10.1016/j.jadohealth.2010.08.006 [PubMed: 21338891]

La Greca AM, Lai BS, Llabre MM, Silverman WK, Vernberg EM, & Prinstein MJ (2013). Children's postdisaster trajectories of PTS symptoms: Predicting chronic distress. Child & Youth Care Forum, 42, 351–369. doi:10.1007/s10566-013-9206-1 [PubMed: 24683300]

La Greca AM, Silverman WK, Vernberg EM, & Prinstein MJ (1996). Symptoms of posttraumatic stress in children after Hurricane Andrew: A prospective study. Journal of Consulting and Clinical Psychology, 64, 712–723. doi:10.1037/0022-006X.64.4.712 [PubMed: 8803361]

Lai BS, La Greca AM, & Llabre MM (2014). Children's sedentary activity after hurricane exposure. Psychological Trauma: Theory, Research, Practice, and Policy, 6, 280–289. doi:10.1037/a0033331

Layous K, Chancellor J, & Lyubomirsky S (2014). Positive activities as protective factors against mental health conditions. Journal of Abnormal Psychology, 123, 3–12. doi:10.1037/a0034709 [PubMed: 24661154]

Masyn KE (2013). Latent class analysis and finite mixture modeling In Little TD (Ed.), The Oxford handbook of quantitative methods in psychology (Vol. 2, pp. 551–611). New York, NY: Oxford University Press.

Moore SA, Widales-Benitez O, Carnazzo KW, Kim EK, Moffa K, & Dowdy E (2015). Conducting universal complete mental health screening via student self-report. Contemporary School Psychology, 19, 253–267. doi:10.1007/s40688-015-0062-x

Muthén LK, & Muthén BO (2017). Mplus user's guide (8th ed.). Los Angeles, CA: Muthén & Muthén.

Norris FH, Friedman MJ, Watson PJ, Byrne CM, Diaz E, & Kaniasty K (2002). 60,000 disaster victims speak: Part I. An empirical review of the empirical literature, 1981–2001. Psychiatry: Interpersonal and Biological Processes, 65, 207–239. doi:10.1521/psyc.65.3.207.20173

Nylund-Gibson K, Grimm R, Quirk M, & Furlong M (2014). A latent transition mixture model using the three-step specification. Structural Equation Modeling: A Multidisciplinary Journal, 21, 439–454. doi:10.1080/10705511.2014.915375

Park CL (2014). The Meaning Making Model: A framework for understanding meaning, spirituality, and stress-related growth in health psychology. The European Health Psychologist, 15, 40–47. doi:10.7213/revistapistispraxis.06.001.DS01

Rubens SL, Felix ED, & Hambrick EP (2018). A meta-analysis of the impact of natural disasters on internalizing and externalizing problems in youth. Journal of Traumatic Stress, 31, 332–341. doi:10.1002/jts.22292 [PubMed: 29870078]

Scales PC, Benson PL, Leffert N, & Blyth DA (2000). Contribution of developmental assets to the prediction of thriving among adolescents. Applied Developmental Science, 4, 27–46. doi:10.1207/S1532480XADS0401_3

Self-Brown S, Lai BS, Thompson JE, McGill T, & Kelley ML (2013). Posttraumatic stress disorder symptom trajectories in Hurricane Katrina affected youth. Journal of Affective Disorders, 147, 198–204. doi:10.1016/j.jad.2012.11.002 [PubMed: 23206321]

Silverman WK, & La Greca AM (2002). Children experiencing disasters: Definitions, reactions, and predictors of outcomes In La Greca AM, Silverman WK, Vernberg EM, & Roberts MC (Eds.), Helping children cope with disasters and terrorism (pp. 11–33). Washington, DC: American Psychological Association. doi:10.1037/10454-001

Sprague CM, Kia-Keating M, Felix ED, Afifi T, Reyes G, & Afifi W (2015). Youth psychosocial adjustment following wildfire: The role of family resilience, emotional support, and concrete support. Child & Youth Care Forum, 44, 433–450. doi:10.1007/s10566-014-9285-7

Uchida Y, Takahashi Y, & Kawahara K (2014). Changes in hedonic and eudaimonic well-being after a severe nationwide disaster: The case of the Great East Japan Earthquake. Journal of Happiness Studies, 15, 207–221. doi:10.1007/s10902-013-9463-6

Vermunt JK (2010). Latent class modeling with covariates: Two improved three-step approaches. Political Analysis, 18, 450–469. doi:10.1093/pan/mpq025

Vezzali L, Drury J, Versari A, & Cadamuro A (2016). Sharing distress increases helping and contact intentions via social identification and inclusion of the other in the self: Children's prosocial behaviour after an earthquake. Group Processes & Intergroup Relations, 19, 314–327. doi:10.1177/1368430215590492

Weems CF, & Overstreet S (2008). Child and adolescent mental health research in the context of Hurricane Katrina: An ecological needs-based perspective and introduction to the special section. Journal of Clinical Child & Adolescent Psychology, 37, 487–494. doi:10.1080/15374410802148251 [PubMed: 18645740]

You S, Furlong MJ, Dowdy E, Renshaw TL, Smith DC, & O'Malley MD (2014). Further validation of the Social and Emotional Health Survey for high school students. Applied Research in Quality of Life, 9, 997–1015. doi:10.1007/s11482-013-9282-2

You S, Furlong MJ, Felix E, & O'Malley M (2015). Validation of the Social and Emotional Health Survey for five sociocultural groups: Multigroup invariance and latent mean analyses. Psychology in the Schools, 52, 349–362. doi:10.1002/pits.21828

Public Policy Relevance:

Disaster exposure and subsequent life stressors can affect social-emotional health. Stress overload may happen for the most highly exposed, but for more moderately exposed, additional life stressors impact social-emotional health. Policy makers need to consider how to support the range of disaster survivors and their changing needs over the long haul of disaster recovery, not only the immediate impact.
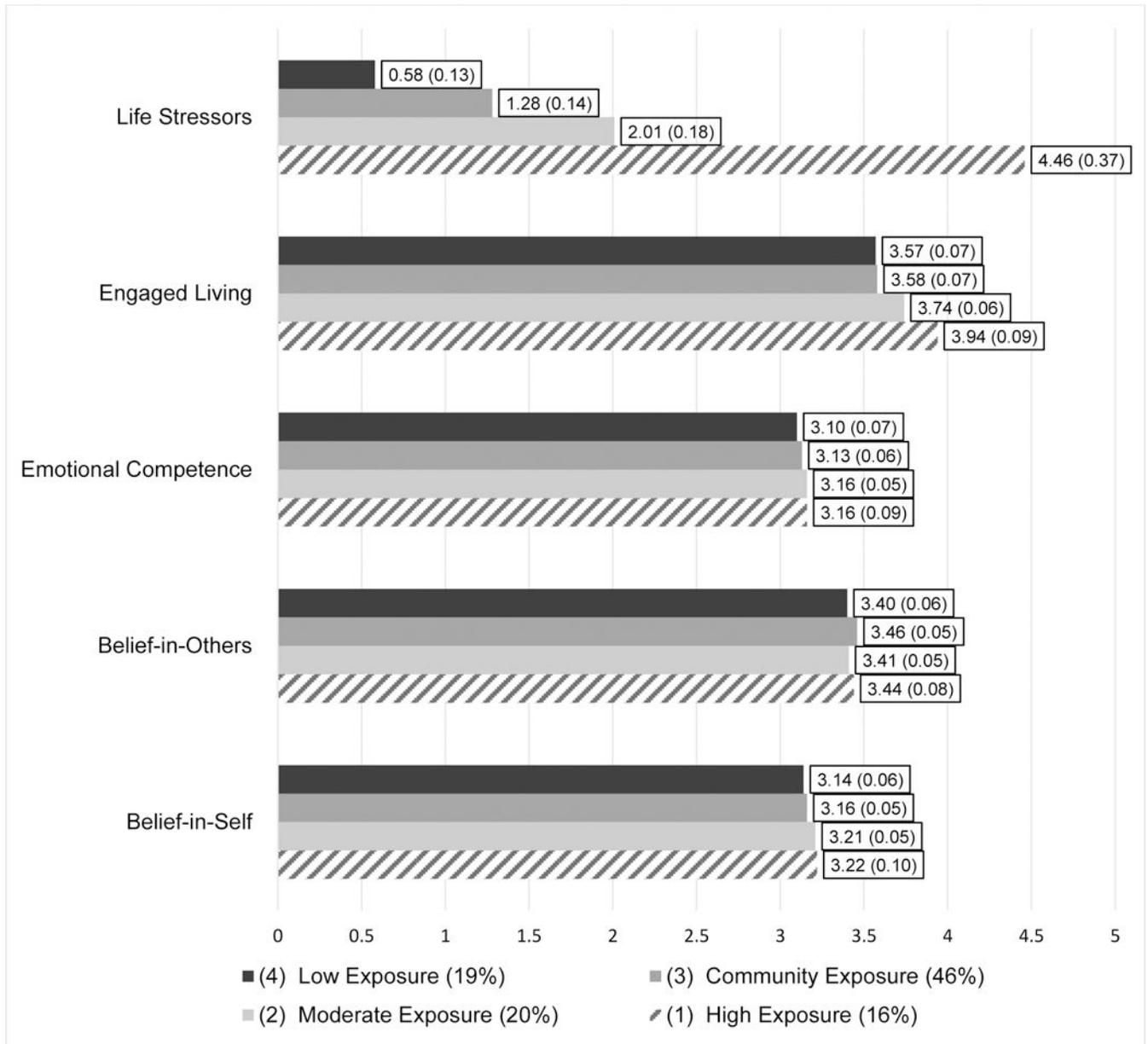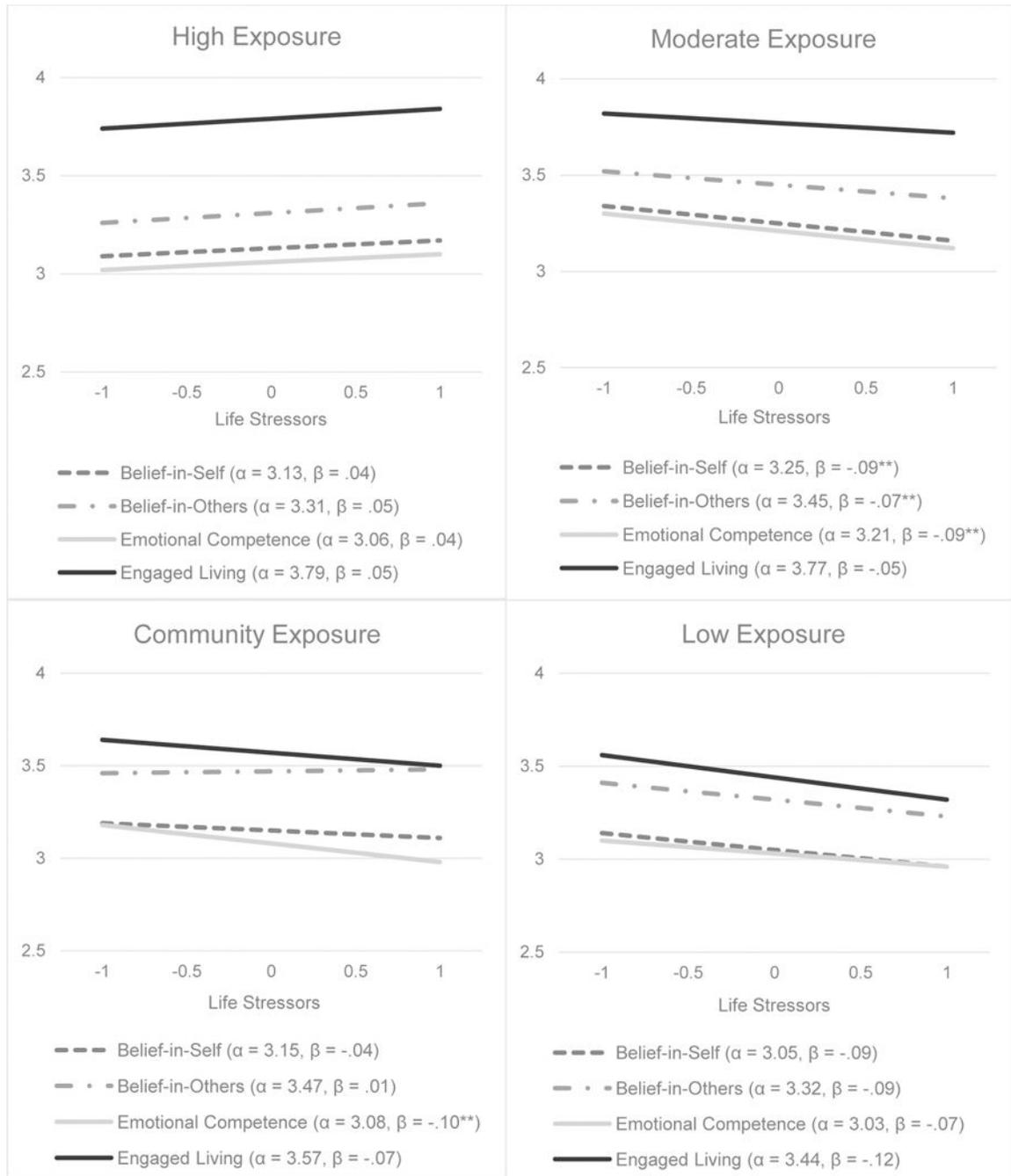
Figure 1.
Means of social-emotional health domains and life stressors across classes of disaster exposure. Pairwise Wald tests of equality for social-emotional health domains and life stressors across classes of disaster exposure ($df = 3$) found significant differences ($p < .01$) for *Engaged Living* between class 1 and all other classes, and for *life stressors since the disaster* between all classes.

Figure 2.
Modeling results of the mixture regression of life stressors (grand-mean centered) on social-emotional health domains by disaster exposure class. *** p < .01* for the regression parameter (e.g., the parameter is significantly different than zero).

Table 1

Correlations and Descriptive Statistics (N = 486)

	1	2	3	4	5	6
1. Flood Exposure	–					
2. Life Stressors	.57***	–				
3. Belief-in-Self	.05	−.11*	–			
4. Belief-in-Others	.02	−.08	.65***	–		
5. Emotional Competence	.04	−.14**	.70***	.62***	–	
6. Engaged Living	.14**	−.02	.65***	.61***	.55***	–
Mean	3.33	1.59	3.17	3.43	3.13	3.65
Standard Deviation	2.23	1.92	.56	.50	.59	.68
Observed Range	0.00–10.00	0.00–9.00	1.00–4.00	1.00–4.00	1.00–4.00	1.00–4.83

*
$p < .05$

**
$p < .01$

***
$p < .001.$