

Abstract

Trauma survivors' experiences of perceived posttraumatic growth (PTG) are thought to be dynamic, with levels varying over time. Although a small body of literature has examined PTG trajectories, key limitations include the lack of pre-event data and little consideration of the non-disaster-related resources and stressors experienced by survivors following the trauma event. The present study investigated factors associated with stability and shifts in PTG over the course of approximately 10 years in low-income, primarily Black mothers who survived Hurricane Katrina. Drawing on a multi-wave dataset that included pre-disaster data, three distinct courses of PTG were identified: (1) *Consistently High PTG* (31.6%); (2) *Low and Decreasing PTG* (38.3%); and (3) *Increasing PTG* (30.1%). A range of psychosocial resources, including survivors' sense of purpose, neighborhood satisfaction, positive religious coping, and perceived social support, were associated with membership in these groups. Overall stressor scores were significantly associated with membership in the *Low and Decreasing PTG* course relative to either the *Consistently High PTG* or *Increasing PTG* courses. Additionally, those experiencing higher levels of financial instability experienced increased odds of membership in the *Low and Decreasing PTG* course relative to the *Consistently High PTG* course. Although more research is needed, the results suggest that PTG is a process that can be both facilitated and impeded by experiences and resources not associated with the initial traumatic event itself. This presents novel opportunities for clinical intervention and policies to better support survivors in experiencing growth in the wake of disaster.

Keywords: Hurricane Katrina, natural disaster, posttraumatic growth, long-term recovery, stress

Long-term Courses of Posttraumatic Growth in Survivors of Hurricane Katrina

Posttraumatic growth (PTG) is defined as the perceived positive psychological change experienced as a result of the struggle with highly challenging life circumstances (Tedeschi & Calhoun, 2004), and has been documented in a variety of contexts from survivors of medical illness to refugee camps. Posttraumatic growth occurs in reaction to trauma-related challenges to survivors' assumptive world, or their beliefs about the world and themselves (Parkes, 1988).

Tedeschi and Calhoun (2004) describe PTG as a process that requires a variety of mechanisms, including intrusive and deliberate rumination, and, critically, a reduction of emotional distress. As such, PTG may be sensitive to the ups and downs of survivor experiences after a traumatic experience and the cognitive burdens survivors face as they attempt to process information in chaotic situations (Workman, 2016). The experiences of trauma and loss during the actual traumatic experience can influence trajectories of recovery and the development of PTG (Lowe, Rhodes, Zwiebach, & Chan, 2009; Zwiebach, Rhodes, & Roemer, 2010). Likewise, successive challenges can tax survivors' internal abilities to cope, and material and internal resources may be diverted from the internal processes that lead to PTG and toward addressing immediate stressors and challenges. As challenges are resolved and survivors' contexts stabilize, they may experience particular factors that help promote the development of PTG over time, as well, which may explain, in part, some of the trajectories of increasing PTG identified in other studies. From this perspective, PTG may be more accurately characterized as an iterative process that shifts as survivors' circumstances and priorities change over time, just as our assumptive worlds are constantly adjusting to and incorporating new sensory input (Parkes, 1988). Such processes may be sensitive to both the internal and external challenges and strengths experienced by each survivor.

Despite the implications of shifting levels of PTG over time, a prominent shortcoming in the literature results from a majority of studies assessing PTG utilizing cross-sectional surveys that occur three months to one year following the trauma (Infurna & Jayawickreme, 2019). This gap in the research is unsurprising given the complexity and ethical considerations involved in conducting longitudinal studies in populations who have survived disasters (Frank & Trinidad, 2007). However, a growing number of studies have successfully examined the trajectories of PTG over longer periods of time (e.g., Bachem et al., 2018; Danhauer et al., 2015; Kyutoku, Dan, Yamashina, Komiyama, & Liegey-Dougall, 2021; Rzeszutek & Gruszczynska, 2021). In each case, multiple trajectories of reported PTG were found in the study samples, with membership in different trajectories varying by factors such as age, race, coping strategies, and social support. The presence of these different trajectories may indicate that the specific circumstances and resources available to survivors following a trauma are factors in the development of PTG.

Of particular note are two studies utilizing data from the National Health and Resilience in Veterans Study (NHRVS) which examined trajectories over a four-year period. The NHRVS was established to evaluate factors associated with successful aging, psychological resilience, and well-being in a sample of more than 2,000 American veterans (Tsai, Sippel, Mota, Southwick, & Pietrzak, 2016). A cluster analysis of 1,838 U.S. veterans across two time points (2011 and 2013) identified five different courses of PTG: Consistently Low PTG, Consistently High PTG, Moderately Declining PTG, Dramatically Declining PTG, and Increasing PTG (Tsai et al., 2016). An extension of this work over three time points between 2011 and 2015 identified three trajectories of PTG: Low and Decreasing PTG, Consistently Moderate PTG, and High and Increasing PTG (Tsai & Pietrzak, 2017). Survivors' reported sense of purpose in life, spirituality,

and social connectedness, the number of medical conditions reported, and trauma exposures were all significantly associated with PTG trajectory membership. These studies highlighted the importance of both positive and negative internal resources and external experiences in PTG.

Taken together, the findings from the NHRVS and other longitudinal studies indicate the presence of several factors significantly associated with the course of PTG over time. Most frequently, the utilization of coping strategies was found to be associated with PTG, such that a more active engagement with coping and the traumatic experience correlated with higher levels of PTG over time (Barskova & Oesterreich, 2009; Danhauer et al., 2015; Goldberg, McDonald, & Perrin, 2019; Guo et al., 2017). This finding lends additional support to Tedeschi and Calhoun's conceptualization of PTG as a process that requires active engagement to flourish. Relatedly, having a sense of purpose was associated with higher levels of PTG, which may capture a portion of the meaning-making process associated with PTG where stronger sense of purpose may scaffold survivors' reconstruction of the assumptive world. Social support was also found to be associated positively with levels of PTG (Barskova & Oesterreich, 2009; Collazo-Castineira, Rodriguez-Rey, Garrido-Hernansaiz, & Collado, 2022; Tsai & Pietrzak, 2017), indicating the importance of recognizing the survivor in connection with others.

In summary, studies of PTG highlight the role of material, economic, and psychological resources in the wake of a potentially traumatic experience (Measham et al., 2014; Porter & Haslam, 2005; Sleijpen et al., 2016; Teodorescu et al., 2012). However, less is known about the longer-term patterns of meaning-making following natural disasters in marginalized populations and how such patterns may be associated with non-disaster-related stressors and resources. This is particularly important given the prevalence of weather-related traumatic events (Goldstein et al., 2016), with mounting evidence suggesting that such events are increasing in both frequency

and intensity (Intergovernmental Panel on Climate Change [IPCC], 2012). Natural disasters, most notably hurricanes, are associated with a wide range of adverse mental health consequences which are not distributed equally in the population (Neria et al., 2008; Raker et al., 2019). More research is needed to contextualize the process of PTG within survivors' lived experiences and to understand how resources and challenges affect the presence of PTG over a greater length of time. Moreover, there is a need to control for pre-traumatic factors, posttraumatic stressors, and psychosocial resources that are available to the survivor. Including these factors helps to delineate the role pre-disaster status may play in longer-term recovery and meaning-making post-disaster while also allowing for the incorporation of life events and conditions that are present years after the event. Further, research has identified the impact of cumulative stressors and poverty on positive psychosocial outcomes (Harville et al., 2011; Normand & Sommet, 2019), as well as the importance of examining both specific and cumulative stressors (Slopen, Meyer, & Williams, 2018), yet there is little to no investigation of such cumulative burden in studies of PTG. Given the theoretical role of resources and stressors in the development, maintenance, and/or deterioration of PTG (Mangelsdorf, Eid, & Luhmann, 2019), acknowledgment of the factors present in and around the individual more broadly over time could meaningfully add to our theoretical and clinical understanding of PTG.

The Present Study

The present study was designed to: (1) identify courses of PTG over a period of approximately 10 years in survivors of Hurricane Katrina; (2) account for pre-disaster resources and context; (3) identify significant predictors of group membership in courses of PTG using a series of psychosocial resources, cumulative stressor burden, and specific psychosocial stressors; and (4) identify significant predictors of group membership using models of psychosocial

resources and stressors. The baseline demographic and psychological factors were controlled in all aims. Resources significantly associated with PTG in previous research, such as survivors' religious coping styles, sense of purpose in life, and their perceptions of their social support networks and neighborhoods, were explored. Stressors were addressed both cumulatively and independently and included self-reports of stressors from multiple domains that occurred well after Hurricane Katrina dissipated. This approach sought to extend findings from previous studies by identifying the continuing associations of specific resources and experiences with PTG during the shorter timeframes in other studies. The present study also aimed to further our understanding of PTG by investigating the associations between later potentially stressful experiences unrelated to the initial traumatic event and reported levels of PTG.

Methods

Participants and Procedures

The current study drew on data from a pre-existing and ongoing research project called the Resilience in Survivors of Katrina (RISK) Project. Initiated in 2003 as an effort to evaluate strategies to improve academic outcomes in low-income single parents between the ages of 18-35 called the Opening Doors Demonstration, the study was re-oriented toward understanding the ways weather-related disaster impacts the lives of vulnerable people and their families following Hurricane Katrina's landfall in the Gulf coastline in 2005. The RISK Project has included five waves of quantitative data, two collected prior to Hurricane Katrina and three in the storm's aftermath. The baseline wave of data was collected in 2003-2004, the second wave in 2005, the third wave was conducted in March 2006-March 2007. The fourth and fifth waves of data were collected March 2009-April 2010 and November 2016-November 2018, respectively. The initial study sample consisted of 1,019 participants, 92.4% of which were female. Inclusion in the

current study was based on the participants having completed data for the dependent variable (scores on the Posttraumatic Growth Inventory) at both Wave 4 and Wave 5. Given that men did not complete Wave 5 data collection, the present study sample included only women. The study had a final sample size of $N = 534$. T-test and Chi-square comparisons were conducted to determine the extent to which, if any, participants included in the present study differed significantly from those who were excluded on all demographic, independent, and dependent variables. Participants included in the study differed significantly from those excluded on the following: natural disaster exposure, financial instability, and overall stressor exposure, with participants included in the study scoring higher on each of these variables.

Measures

Baseline and Hurricane Katrina-Related Variables

Drawing on previous research (Lowe, Manove, & Rhodes, 2013), the following baseline variables were included in the analysis to account for pre-disaster status: Age in years, number of children, marital status (married/cohabitating vs. other), receipt of social support benefits (yes/no), psychological distress, and perceived social support.

General Psychological Distress

The Kessler Psychological Distress Scale (K6) is a six-item screening measure of nonspecific psychological distress (Kessler et al., 2003). In the present study, the K6 was used to assess participants' pre-disaster distress levels. Participants rated items on a 5-point Likert scale ranging from 0 ("none of the time") to 4 ("all the time"). The pre-disaster K6 scale demonstrated good reliability, with $\alpha = .77$.

Hurricane Katrina-related Stressors

Stressors associated with exposure to Hurricane Katrina were assessed using participant reports on a trauma scale to assess participants' experiences during and immediately following Hurricane Katrina. This instrument was jointly designed by teams at the Kaiser Family Foundation, the *Washington Post*, and the Harvard School of Public Health (Brodie, Weltzien, Altman, Blendon, & Benson, 2006). This study also included an item to account for experiencing the death of a family member or friend as a result of Hurricane Katrina. Responses were provided in a dichotomous (yes/no) format and were summed to create a hurricane-related stressor score from 0-9.

Posttraumatic Stress

Survivors' reports of posttraumatic stress (PTS) were assessed using the Impact of Event Scale – Revised (IES-R, Weiss & Marmar, 1996). The IES—R is a 22-item self-report measure that was used to assess symptoms of posttraumatic stress at Waves 3, 4, and 5. Questions asked respondents to report their level of distress related to Hurricane Katrina within the past seven days on a 5-point Likert scale, ranging from 0 (“not at all”) to 4 (“extremely”; Weiss & Marmar, 1996). Scores for this scale can range from 0-88, with higher scores indicating greater levels of psychological distress. The IES-R demonstrated excellent reliability in the present study at Wave 4, with $\alpha = .95$.

Psychosocial Resources

Perceived Social Support

Participants' ratings of their perceived social support were assessed using the Social Provisions Scale (SPS; Cutrona & Russell, 1987). The SPS is an eight-item measure which asks respondents the degree to which they agree with statements about their sense of social support. Responses were rated on a four-point Likert scale, from 0 (“strongly disagree”) to 3 (“strongly

agree”), and were summed to create an overall score. Higher scores indicated greater levels of perceived support. The SPS at baseline and Wave 4 demonstrated acceptable reliability at both time points, with $\alpha = .78$.

Satisfaction with Current Neighborhood

Participants’ reported sense of satisfaction with their current neighborhood, a measure of their satisfaction with their current geographic and social context, was assessed with a single item, “How satisfied are you with your current neighborhood?”. This item was included in the Wave 4 survey, and was rated on a 5-point Likert scale from 1 (“very dissatisfied”) to 5 (“very satisfied”).

Religious Coping Styles

This study used the Brief RCOPE to assess postdisaster religious coping strategies (Pargament, Feuille, & Burdzy, 2011). The Brief RCOPE is a 14-item scale with two subscales (positive religious coping and negative religious coping). Positive religious coping indicates a sense of spiritual connectedness and benevolent world view when confronting challenges, while negative religious coping reflects internal spiritual and personal struggles with oneself, others, and the world. Responses for both subscales were rated on a four-point Likert scale, from 0 (“Not at all”) to 3 (“A great deal”). Higher scores on the positive religious coping subscale indicate higher levels of positive religious coping. Higher scores on the negative religious coping subscale indicate less negative religious coping strategies. The positive religious coping subscale demonstrated excellent reliability, with $\alpha = .94$. The negative religious coping subscale demonstrated good reliability, with $\alpha = .87$.

Purpose in Life

Purpose in life was assessed using a seven-item subscale of the Sense of Self measure developed by the MacArthur Network on Transitions to Adulthood for the Opening Doors Demonstration (Brock & Richburg-Hayes, 2006). The items were rated a 4-point Likert scale from 1 (“strongly disagree”) to 4 (“strongly agree”). Higher scores indicate a greater sense of purpose in life. Data for the present study were drawn from Wave 4 of data collection. The sense of purpose in life measure demonstrated good reliability, with $\alpha = .85$.

Stressors

To evaluate the potential associations between post-disaster stressors and patterns of PTG, a series of composite variables were created for the present study that tracked exposure to potential stressors experienced by participants between Wave 4 and Wave 5 (2009-2018). Drawing from previous research, four domains were identified: (1) weather-related disaster exposure; (2) financial instability; (3) child-related stressors; and (4) participant health stressors. Responses were dichotomized into “yes/no” responses and were summed to create a range of events where higher scores indicated a greater number of stressors experienced. To test whether PTG is impacted by the cumulative number of stressors, regardless of the stressor domain, the scores of the different stressor domains were summed to create a total number of stressors. For each stressor, higher scores indicated a greater number of reported stressors experienced.

Weather-related Disaster Exposure

This study created an index of participants’ self-reported exposure to weather-related disasters occurring between Wave 4 and Wave 5 (2009-2018) including Hurricanes: Irene (2011), Isaac (2012), Sandy and (2012), Harvey (2017), Irma (2017), and Maria (2017); and flooding in Louisiana and Mississippi (2016 and 2017, respectively).

Financial Instability

This study created a seven-item index to assess participants' level of financial instability. Financial instability was operationalized as participants reporting that they were unemployed or had difficulty meeting basic needs (paying for rent, medical bills, utility bills, and having enough food) "fairly often" or "very often." These items were assessed at Wave 5, and asked about difficulties occurring within the previous six months.

Child-related Stressors

Child-related stressors included parent reports of their children's risk-taking behaviors, such as use of drugs and alcohol, and parents' reports on the internalizing and externalizing behaviors subscales of the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997). The externalizing and internalizing behaviors subscales of the SDQ were used. Using established cutoff scores, parents who scored their children in the "borderline" or "abnormal" range were coded as "1" and those in the "normal" range were coded as "0." To calculate the overall index score, items from all child-related stressor domains were summed.

Participant Health Stressors

Data provided in Wave 5 was used to create an index of the number of adverse health experiences diagnosed or experienced within the previous 12 months. Participant health stressors included ailments such as back pain and migraines, diagnoses of cancer, heart disease, and diabetes. Emergency room and overnight stays in the hospital were included. Responses were coded in a dichotomous (yes/no) format, excepting the number of emergency room visits and overnight hospital stays. For these two, any number of visits above zero was coded as "1," with zero visits being coded as "0." Responses to participant health items were summed.

Posttraumatic Growth

The Posttraumatic Growth Inventory (PTGI) was used to quantitatively assess participants' reports of PTG. The PTGI is a 21-item scale in which participants rate the extent to which they experience positive changes across a variety of domains as a result of Hurricane Katrina. Responses were rated on a 5-point Likert scale, from 0 ("not at all") to 4 ("extremely"). To create an overall PTG score, responses are summed with higher scores indicating greater levels of reported growth. The PTGI demonstrated excellent reliability at both Wave 4 and Wave 5, with $\alpha = .93$ and $\alpha = .95$, respectively.

Data Analysis

Cluster analysis

A two-step cluster analysis was conducted to identify latent clusters of patterns of PTG using total PTGI scores at Wave 4 and Wave 5. The goal of a two-step clustering approach is to organize participants such that the members of each group are as similar with each other as possible along the variables of interest, while making the groups as distinct as possible. Class solution statistics were interpreted using Schwarz's Bayesian Criterion (BIC), BIC Change, and ratio of BIC change. The ideal class solution was identified by the BIC scores, with lower scores indicating a better model fit for the data (Tabachnick & Fidell, 2007). To confirm the cluster solution was optimal, the same analysis was conducted using Akaike Information Criterion (AIC), with lower values indicating better model fit (Tabachnick & Fidell, 2007).

Following the cluster analysis, a one-way ANOVA was conducted to determine the presence of mean differences between the clusters identified in the cluster analysis. For those variables which violated the assumption of homogeneity of variance, statistical significance for the omnibus test was determined using either the Welch or Brown-Forsythe tests, which are robust to heterogeneity of variance and incidence of skew (Glantz, Slinker, & Neilands, 2016).

For dichotomous variables, a Chi-square test was conducted. For all significant effects identified, post hoc analyses were conducted using the Tukey Honestly Significant Difference (HSD) test or the Games-Howell test (Glantz, Slinker, & Neilands, 2016).

Multinomial Logistic Regression Models

Five models of the relationship between the predictor variables and membership in the clusters were created. For a review of the specific variables included in each model, see Table 1. Variables were entered into the model in chronological order and were grouped thematically (i.e., baseline variables, Hurricane Katrina variables, Wave 4 IES-R scores, Wave 4 psychosocial resources, then stressor variables). The models' Pseudo R^2 value (Nagelkerke) is also reported, with higher values indicating better model fit. Further, results of the MLRs were interpreted using odds ratios (OR), where an OR >1 would indicate an increased probability of falling into the comparison group relative to the referent group as the value of the predictor increases (comparison outcome is more likely; UCLA Statistical Consulting Group, 2021).

Model 1 – Psychosocial resources. Model 1 assessed the role of psychosocial resources in predicting membership in the clusters of PTG. Covariates included: Number of children at baseline, perceived social support at baseline, psychological distress at baseline, participant age at baseline, receipt of social benefits at baseline, marital status at baseline, Hurricane Katrina-related exposure, and level of posttraumatic stress symptoms at Wave 4. Predictor variables, assessed at Wave 4, included sense of purpose in life, perceived social support, positive religious coping, negative religious coping, and neighborhood satisfaction.

Model 2 – Overall stressors. Model 2 addressed the association between the overall number of stressors and membership in the clusters. This model included the same covariates as Model 1 (as did all following models). Predictor variables were counts of the potentially adverse

experiences occurring between Wave 4 and Wave 5 (i.e., weather-related disaster exposure, financial instability, child-related stressors, and participant health stressors) that were then summed to indicate an overall count of potential stressor experiences.

Model 3 – Psychosocial stressors. Model 3 utilized the same covariates as previous models and was conducted to determine the significance of specific types of stressors in predicting membership in one of the PTG clusters. The predictor variables included weather-related disaster exposure, financial instability, child-related stressors, and participant health-related stressors.

Model 4 – Combined model (overall stressors). In Model 4, the covariates and predictors from Models 1 and 2 were combined to investigate the manner in which the resources and overall stressor levels functioned as predictors of PTG cluster membership.

Model 5 – Combined model (psychosocial stressors). Model 5 combined Models 1 and 3 to investigate individual contribution of each psychosocial stressor variable.

Results

Sample Means and Standard Deviations for Predictor Variables

Baseline demographic descriptives for the full sample can be found in Table 2. For an overview of the means and standard deviations of all predictor variables across the full sample, see Table 3.

Aim 1: Identifying Courses of Posttraumatic Growth *Two-step Cluster Analysis*

Cluster analysis revealed that a three-group solution best fit the data (BIC = 154.97; BIC ratio of change = .395; ratio of distance measures = 2.27; AIC = 152.90; AIC ratio of change = .416; ratio of distance measures = 2.14), with similar clusters identified using both BIC and AIC metrics. Means and standard deviations of the demographic, independent, and outcome variables

are provided in Table 4 for the sample grouped by their clusters, including the results of the post hoc analyses (Tukey's HSD and Games-Howell). The groups included a "*Consistently High PTG*" group ($n = 168$; weighted 31.6%) with scores above "moderate" at both Wave 4 and Wave 5, a "*Low and Decreasing PTG*" group ($n = 204$; weighted 38.3%) with scores less than "moderate" at Wave 4 which decreased at Wave 5, and an "*Increasing PTG*" group ($n = 160$; weighted 30.1%) which had PTGI scores not significantly different from the *Low and Decreasing PTG* group at Wave 4, with scores in Wave 5 not differing significantly from the *Consistently High PTG* group.

Assessing Cluster Differences

Psychosocial Resources. Significant differences were found for purpose in life, $F(2, 518) = 21.39, p < .001$, positive religious coping $F(2, 519) = 37.17, p < .001$, satisfaction with current neighborhood, $F(2, 522) = 4.54, p = .01$, and perceived social support, $F(2, 516) = 7.60, p < .001$.

Regarding purpose in life, post hoc analyses indicated that the average score on the Purpose of Life scale at Wave 4 was significantly higher in the *Consistently High PTG* cluster than in the *Low and Decreasing PTG* (*Mean difference* = 1.90, *SE* = 0.30; $p < .001$) and *Increasing PTG* (*Mean difference* = 1.54, *SE* = .31; $p < .001$).

For positive religious coping, post hoc analyses indicated that the average score on the positive religious coping subscale was significantly greater in the *Consistently High PTG* cluster than in either the *Low and Decreasing PTG* cluster (*Mean difference* = 4.85, *SE* = 0.55; $p < .001$) or the *Increasing PTG* cluster (*Mean difference* = 2.74, *SE* = 0.50; $p < .001$). Mean scores on the positive religious coping subscale were significantly greater in the *Increasing PTG* cluster

than in the *Low and Decreasing PTG* cluster as well (*Mean difference* = 2.12, *SE* = 0.62; $p = .002$).

For satisfaction with current neighborhood at Wave 4, post hoc analyses indicated that the average score on this item was significantly greater in the *Consistently High PTG* cluster than in the *Low and Decreasing PTG* cluster (*Mean difference* = 0.37, *SE* = 0.13; $p = .01$).

For perceived social support at Wave 4, post hoc analyses indicated that those in the *Consistently High PTG* cluster scored significantly higher than did those in either the *Low and Decreasing PTG* (*Mean difference* = 1.42, *SE* = 0.37; $p < .001$) or *Increasing PTG* (*Mean difference* = 0.93, *SE* = 0.39; $p = .05$) clusters.

Overall Stressors and Stressor Domains. Significant effects were found for overall stressors, $F(2, 348.06) = 3.02$, $p = 0.05$; and financial instability, $F(2, 349.04) = 4.25$, $p = .02$. However, for overall stressors, post hoc analyses did not identify any specific group differences. Regarding the mean differences in scores on the financial instability index, post hoc analyses indicated that participants in the *Consistently High PTG* cluster endorsed significantly lower financial instability than those in the *Low and Decreasing PTG* cluster (*Mean difference* = -0.46, *SE* = 0.16; $p = .02$).

Aim 2: Psychosocial and Stressor Factors Associated with Courses of PTG

Multinomial Logistic Regressions

Model 1 – Psychosocial Resources. The fit between the model containing only the intercept and data improved with the addition of the predictor variables, $X^2(26, N = 450) = 134.53$, Nagelkerke $R^2 = .29$, $p < .001$. The following predictors were found to contribute significantly to the model: Sense of purpose in life, perceived social support, satisfaction with

current neighborhood, and positive religious coping. All odds ratios of group membership in all models by predictor can be found in Table 5.

Model 2 – Overall Psychosocial Stressors. The fit between the model containing only the intercept and data improved with the addition of the predictor variables, $X^2(18, N = 450) = 46.93$, Nagelkerke $R^2 = .11$, $p < .001$. In the model, overall stressors, $X^2(2, 450) = 8.85$, $p = .01$ were found to contribute significantly.

Model 3 – Specific Psychosocial Stressors. Given that the overall stressor variable was a significant predictor of membership in the three clusters of PTG, an additional multinomial logistic regression was conducted using each of the individual stressor domains to determine whether there was a specific domain driving the effect found for overall stressors. The fit between the model containing only the intercept and data improved significantly with the addition of the predictor variables $X^2(24, N = 450) = 54.96$, Nagelkerke $R^2 = .13$, $p < .001$. Only financial instability, $X^2(2, 450) = 9.64$, $p = .008$, contributed significantly to the model.

Model 4 – Combined Psychosocial Resources and Overall Stressors. To determine the extent to which the predictors from both Models 1 and 2 might predict membership in the three PTG clusters, a multinomial logistic regression was conducted. The model contained the same covariates as the previous models. The fit between the model containing only the intercept and data improved significantly with the addition of the predictor variables $X^2(28, N = 450) = 141.23$, Nagelkerke $R^2 = .30$, $p < .001$.

The following predictors were found to contribute significantly to the model: purpose in life, $X^2(2, 450) = 18.30$, $p < .001$; satisfaction with current neighborhood, $X^2(2, 450) = 6.60$, $p = .04$; positive religious coping, $X^2(2, 450) = 35.76$, $p < .001$; and overall stressors, $X^2(2, 450) = 6.71$, $p = .04$.

Model 5 – Combined Psychosocial Resources and Psychosocial Stressors. Combining Model 1 and Model 3 allowed for the investigation of the predictive ability of both psychosocial resources and stressor domains and resources in determining odds of membership in the different courses of PTG. As with Model 4, all covariates were consistent with previous models. The fit between the model containing only the intercept and data improved significantly with the addition of the predictor variables $\chi^2(34, N = 450) = 148.80$, Nagelkerke $R^2 = .32$, $p < .001$.

The following predictors were found to contribute significantly to the model: purpose in life, $\chi^2(2, 450) = 17.81$, $p < .001$; satisfaction with current neighborhood, $\chi^2(2, 450) = 6.14$, $p < .05$; positive religious coping, $\chi^2(2, 450) = 38.26$, $p < .001$. No psychosocial stressors contributed significantly to the model.

Discussion

The present analyses accounted for both pre-disaster status and postdisaster stressors and psychosocial resources in a sample of low-income mothers exposed to Hurricane Katrina. Three distinct patterns of PTG were identified. Over a third of survivors (38.3%) were clustered into a pattern typified by low and decreased levels of PTG four and 12 years following Hurricane Katrina (*Low and Decreasing PTG*), 31.6% in a pattern that reported high levels of PTG at both time points (*Consistently High PTG*), and 30.1% of participants reporting increasing personal growth (*Increasing PTG*) from four years to 12 years after Hurricane Katrina.

Several psychosocial factors (sense of purpose in life, perceptions of social support and neighborhood satisfaction, positive religious coping), as well as stressors (overall stressor burden and financial instability) were associated with PTG at year 12. These findings align with previous research that characterizes PTG as a process that occurs over time and is subject to change, rather than a static state that one achieves (Tedeschi & Calhoun, 2004; Tsai & Pietrzak,

2017; Tsai et al., 2016). Taken together with the previous literature, these findings imply that PTG may best be understood as a dynamic process that is associated with internal and external factors, rather than one that is localized solely within the individual (Lee, 2017).

The most consistent predictor of PTG course was positive religious coping. Survivors in the *Increasing PTG* cluster reported higher levels of positive religious coping than those in the *Low and Decreasing PTG* cluster. Positive religious coping in this study was characterized by survivors endorsing forward-looking, compassion-focused, and supportive conceptualizations of their faith. This finding may indicate that one of the factors which separates those members of *Low and Decreasing PTG* cluster and those who report personal growth over time is having an adaptive framework within which to interpret the traumatic experiences that is positive, affirming, and in relationship with an externalized higher power. Future research should investigate the ways in which other belief systems may provide a framework for personal growth in the aftermath of traumatic experiences. It may be that there are certain shared characteristics that establish a sense of control (one's own or through a trusted higher power), pro-growth orientation, or self-forgiveness that create a foundation from which to rebuild one's assumptive world in a positive manner. Notably, negative religious coping did not significantly predict membership in any courses of PTG. This may be due to the more passive framing of the negative religious coping subscale compared to the positive religious coping subscale, which utilized more active, growth-oriented language. Further research is needed to draw more substantial conclusions on the role of negative religious coping in PTG development over time.

Consistent with previous research, membership in PTG courses was also related to participants' sense of purpose in life. Previous research has linked survivors' sense of purpose in life four and 12 years following Hurricane Katrina being associated with higher levels of PTG in

survivors of weather-related disasters at those time points (Lowe, Manove, & Rhodes, 2013; Manove, Poon, Rhodes, & Lowe, 2021). This connection may be driven by items across the PTGI subscales that align with the sense of purpose in life measured in the present study. Sense of purpose in life has also been linked to PTG over time in other contexts beyond weather-related disasters, such as in combat-related trauma (Tsai & Pietrzak, 2017; Tsai et al., 2016), and political violence (Teodorescu et al., 2012). Sense of purpose in life may provide opportunity for growth in the wake of a natural disaster by serving as a compass of sorts as the survivor transitions from disaster relief to recovery. This combination of positive religious coping (meaning making) and sense of purpose in life may offer a strong foundation for rebuilding the assumptive world following trauma. Future research should investigate the nature of the relationship between sense of purpose in life and positive religious coping as a way of improving the long-term ability of survivors to experience PTG following their traumatic experiences.

The present study also identified a positive role for contextual resources in creating the conditions for sustaining high levels of PTG (satisfaction with environment – both social and neighborhood), partially supporting the first hypothesis that psychosocial resources would be associated with patterns of *Consistently High PTG*. This finding has been echoed in previous research which demonstrated that refugees and survivors of human-made disasters who had higher levels of perceived quality of life, stability, and satisfaction with their surroundings demonstrated higher levels of PTG (Measham et al., 2014; Powell, Rosner, Butollo, Tedeschi, & Calhoun, 2003; Sleijpen, Haagen, Mooren, & Kleber, 2016). Similarly, social support was also found to be associated with high levels of PTG over time in U.S. military veterans (Tsai & Pietrzak, 2017). These findings suggest that long-term PTG occurs as a product of both the

person and their environment, although the balance of these factors for each individual may vary. Further longitudinal studies would be necessary to identify the causal nature of this association.

Consistent with the second hypothesis, the present study found that stressors could significantly predict membership in the patterns of PTG, indicating that stressors not related to Hurricane Katrina were associated with the patterns of PTG development in survivors. Notably, as the number of stressors increased, the odds of membership in the *Low and Decreasing PTG* pattern increased relative to membership in either of the other two patterns. That overall stressor levels predicted group membership even when included with the psychosocial resources indicates that efforts to support survivors must not only target specific challenges but address overall stress levels in a holistic manner.

Of those stressors investigated in the present study, higher levels of financial instability increased the odds of being in the *Low and Decreasing PTG* pattern. This finding could indicate that there were survivors who may have had the potential to experience increases in PTG over time, but were impeded by current stressors and limited resources available to ameliorate those stressors. Related research on the effects of stress and poverty have illustrated the ways in which consistent stress exposure limits the cognitive functioning of those who are living in poverty (Mani, Mullainathan, Shafir, & Zhao, 2013). Such cognitive resources are a necessary component of the ruminative process described by Tedeschi and Calhoun in their model of PTG. Other studies have identified that stressors such as unemployment and weak social connections were negatively associated with PTG in a sample of refugees (Teodorescu, Siqueland, Heir, Hauff, Wentzel-Larsen, & Lien, 2012), which lends support to the impact of such instability and burden on survivors' ability to process their traumas over time. Such stressors may consume survivors' attentional resources (Normand & Sommet, 2019), meaning that those energies would

be unavailable for the more deliberate rumination which has been found to be conducive to the development of PTG (Cann et al., 2011; Triplett, Tedeschi, Cann, Calhoun, & Reeve, 2011).

Integrating the present findings with previous research, it appears that PTG is best positioned to flourish when certain dynamics are present: The traumatic experience is perceived as intense enough to challenge the assumptive world; the participant has more stability and fewer stressors following the disaster to constructively ruminate over time; and the survivor possesses some level of positive psychosocial resources through which to frame the reconstruction of their assumptive world. Financial and material stability may make it easier for survivors to devote their cognitive energies toward deliberate rumination about their experiences through the lens of their positive coping frameworks. If the stressors are too frequent and significant, though, it may be that survivors are necessarily focused on the immediate crises they face rather than the disaster they experienced in the past.

The findings of the present study indicate that some aspects of survivors' sense of personal growth in the wake of trauma may require support over longer periods of time than those in which typical relief efforts tend to operate. By reducing experiences of regular, daily stressors directly and/or indirectly, through direct cash transfers or through job training programs, for example, it may be that more of those in the *Low and Decreasing PTG* pattern could have found an increase in their sense of personal growth had they had the resources to deliberately and meaningfully engage in the ruminative process. Researchers have identified promising findings that could support this hypothesis by elucidating the ways in which debt reduction, for example, can facilitate this process, documenting improved cognitive functioning in low-SES individuals (Ong, Theseira, & Ng, 2019). Such improvements could directly contribute to the psychological equilibrium and cognitive functioning that appears to be

conducive to the development and maintenance of PTG over time by reducing the strains of poverty on cognitive performance (Mani, Mullainathan, Shafir, & Zhao, 2013). Such strains leave less mental space for the more abstract, reflective rumination that is a core component of the development of PTG (Tedeschi & Calhoun, 2004).

Limitations

When reviewing the results of the present study, it is essential that several limitations are held in mind in order to properly contextualize the findings. First, all measures used in this study were either participants' reports about their own states or their children's states, which introduces the risk of socially-desirable responding. The single informant model increases the potential for latent, unmeasured constructs or characteristics of the individual to shape perceptions of growth. Further, the potential conceptual overlap between several of the psychosocial resources (i.e., positive religious coping and sense of purpose in life) and specific subscales of the PTGI may indicate that participants' PTGI scores are more sensitive to higher levels of those resources. Future research using the specific subscales of the PTGI could help to clarify any potential links between these constructs. Second, the results presented here are strictly associative in nature rather than causal and are not longitudinal in nature. As such, it may be that the relationship between the predictors and outcomes could be reversed, or perhaps are due to additional factors that were not accounted for in the present study. Third, the statistical approach in the present study was based upon characteristics of the sample and may not generalize to other populations who have survived Hurricane Katrina or other weather-related or human disasters more generally. Indeed, the present sample appeared to be more heavily affected on several measures than the full study sample in the RISK Project, which may further limit generalization.

In addition, the indices created for the purposes of this study to assess the presence of specific stressor domains (i.e., child-related, participant health, financial instability, and weather-related disaster exposure) were limited in two significant ways: (1) Participants did not report high levels of stressors on the indices for weather-related disaster exposure or child-related stressors, which could mean that those indices did not fully capture participants' experiences; and (2) the indices were themselves counts of incidence within a specific window of time and did not assess for prevalence or severity of impact of the stressor event. This approach was chosen from a practical perspective due to the limitations in measures used to assess these experiences, and in a theory-driven manner to determine how participants might be affected by novel shocks or disruptions rather than a chronic stressor, although both types of stressors may impact participant levels of PTG over time (Tsai et al., 2016). Future research could benefit from more detailed assessments of those domains and their association with patterns of PTG over time.

In addition to the limitations to generalization posed by the sample demographics, the present study identifies only Hurricane Katrina exposure as the event(s) that could challenge the assumptive worlds of survivors. Hurricane Katrina, a weather-related disaster, represents a distinct set of challenges to survivors' assumptive worlds, and not all potentially traumatic events are equal when it comes to the likelihood of experiencing PTG (Lowe et al., 2020). Specifically, sexual assault and physical assault, violations of survivors' physical integrity by another, resulted in the lowest levels of PTG in a nationwide study of female nurses in the United States. This aligns with epidemiological findings from trauma research, which identified sexual assault to be the strongest predictor of developing PTSD (Bruce et al., 2001; Olaya, Alonso, Atwoli, Kessler, Vilagut, & Haro, 2015). There is some aspect of such assaults that is particularly corrosive to survivors' assumptive worlds and psychological well-being. It may be that the usual pathways

along which PTG develops, including self-disclosure and social support, are rendered toxic due to the interpersonal nature of the trauma, disrupting the development of PTG or even derailing it completely. Care must be taken to maintain the framing of the present study in relation to exposure to natural disasters when reviewing its implications.

Despite these limitations, the present study is the first of its kind to control for pre-disaster status when addressing long-term patterns of PTG in a large sample of survivors of weather-related disaster over the course of multiple years. This directly addresses two significant concerns around the immediacy of assessment and cross-sectional design so often common in studies of PTG (Infurna & Jayawickreme, 2019). Indeed, the present study was able to identify the importance of cumulative stress and financial instability as contemporaneous stressors that can predict membership in patterns of PTG more than 10 years after Hurricane Katrina. As a result, further research better positioned to address concurrent stressors may provide greater insight into the relational dynamic that exists between the course of survivors' PTG over time and the material and physical resources they have available.

The present study offers insight into survivors' adaptive responses to a weather-related disaster, the way those responses may present over time, and the factors that are associated with that presentation. By evaluating associations between resources, stressors, and PTG both independently and cumulatively, the present study also highlighted the importance of utilizing a more holistic awareness of survivors' context when determining what may be affecting their ability to rebuild their assumptive worlds following a major disaster. Facing a future in which weather-related disasters are going to be more frequent and intense, such an understanding of the process of recovery and meaning-making from such events over time becomes critically important to reduce individual and community suffering and promote personal growth.

References

- Bachem, R., Mitreuter, S., Levin, Y., Stein, J. Y., Xiao, Z., & Solomon, Z. (2018). Longitudinal development of primary and secondary posttraumatic growth in aging veterans and their wives: Domain-specific trajectories. *Journal of Traumatic Stress, 31*, 730-741. DOI: 10.1002/jts.22331
- Barskova, T., & Oesterreich, R. (2009). Post-traumatic growth in people living with a serious medical condition and its relations to physical and mental health: A systematic review. *Disability and Rehabilitation, 31*(21), 1709–1733.
<https://doi.org/10.1080/09638280902738441>
- Brock T, Richburg-Hayes L. *Paying for Persistence. Early Results of a Louisiana Scholarship Program for Low-Income Parents Attending Community College.* MDRC. 2006 Jan 5
- Brodie, M., Weltzien, E., Altman, D., Blendon, R. J. & Benson, J. M. (2006). Experiences of Hurricane Katrina evacuees in Houston shelters: Implications for future planning. *American Journal of Public Health, 96*(8), 1402-1408.
<https://doi.org/10.2105/AJPH.2005.084475>
- Bruce, S. E., Weisberg, R. B., Dolan, R. T., Machan, J. T., Kessler, R. C., Manchester, G., Culpepper, L., & Keller, M. B. (2001). Trauma and Posttraumatic Stress Disorder in Primary Care Patients. *Primary care companion to the Journal of clinical psychiatry, 3*(5), 211–217. <https://doi.org/10.4088/pcc.v03n0504>
- Collazo-Castiñeira, P., Rodríguez-Rey, R., Garrido-Hernansaiz, H. & Collado, S. (2022).

- Prediction of post-traumatic growth in the face of the COVID-19 crisis based on resilience, post-traumatic stress and social participation: A longitudinal study. *Frontiers in Psychology*. DOI: 10.3389/fpsyg.2022.985879
- Cutrona, C. E. & Russell, D. W. (1987). The provisions of social relationships and adaptation to stress. *Advances in Personal Relationships, 1*, 37-67. Greenwich, CT: JAI Press
- Danhauer, S. C., Russell, G., Case, D., Sohl, S. J., Tedeschi, R. G., Addington, E. L., Triplett, K., Van Zee, K. J., Naftalis, E. Z., Levine, B., & Avis, N. E. (2015). Trajectories of posttraumatic growth and associated characteristics in women with breast cancer. *Annals of Behavioral Medicine, 49*, 650-659. DOI 10.1007/s12160-015-9696-1
- Frank, J. B., & Trinidad, A. C. (2007). Katrina relief: Lessons for the academic medical center. *Academic Psychiatry, 31*(3), 196. doi: 10.1176/appi.ap.31.3.196
- Glantz, S. A., Slinker, B. K., & Neilands, T. B. (2016). *Primer of Applied Regression & Analysis of Variance* (3rd Ed.). McGraw-Hill Education.
- Goldberg, L. D., McDonald, S. D., & Perrin, P. B. (2019). Predicting trajectories of posttraumatic growth following acquired physical disability. *Rehabilitation Psychology, 64*(1), 37–49. <https://doi.org/10.1037/rep0000247>
- Goodman, R. (1997). The Strengths and Difficulties Questionnaire: A research note. *Journal of Child Psychology and Psychiatry, 38*, 581-586.
- Guo, J., Fu, M., Xing, J., Qu, Z. & Wang, X. (2017). Coping style and posttraumatic growth among adult survivors 8 years after the 2008 Wenchuan earthquake in China. *Personality and Individual Differences, 111*, 31-36. <https://doi.org/10.1016/j.paid.2017.01.046>
- Harville, E. W., Xiong, X., Smith, B. W., Pridjian, G., Elkind-Hirsch, K., & Buekens, P.

- (2011). Combined effects of Hurricane Katrina and Hurricane Gustav on the mental health of mothers of small children. *Journal of Psychiatric and Mental Health Nursing*, 18(4), 288-296. doi: 10.1111/j.1365-2850.2010.01658.x
- Infurna, F. J., & Jayawickreme, E. (2019). Fixing the growth illusion: New directions for research in resilience and posttraumatic growth. *Current Directions in Psychological Science*, 28(2), 152–158. <https://doi.org/10.1177/0963721419827017>
- Kessler, R. C., Barker, P. R., Colpe, L. J., Epstein, J. F., Gfroerer, J. C., Hiripi, E., Howes, M. J., Normand, S. L., Manderscheid, R. W., Walters, E. E., & Zaslavsky, A. M. (2003). Screening for serious mental illness in the general population. *Archives of General Psychiatry*, 60(2), 184–189. <https://doi.org/10.1001/archpsyc.60.2.184>
- Kyutoku, Y., Dan, I., Yamashina, M., Komiyama, R. & Liegey-Dougall, A.J. (2021). Trajectories of posttraumatic growth and their associations with quality of life after the 2011 Tohoku earthquake and tsunami. *Journal of Traumatic Stress*, 34, 512-525. DOI: 10.1002/jts.22628
- Lee, D. A. (2017). A person-centred political critique of current discourses in post-traumatic stress disorder and post-traumatic growth. *Psychotherapy and Politics International*, 15(2), 1-17. doi: <https://doi.org/10.1002/ppi.1411>
- Lowe, S. R., James, P., Arcaya, M. C., Vale, M. D., Rhodes, J. E., Rich-Edwards, J., Roberts, A. & Koenen, K. C. (2020). Do levels of posttraumatic growth vary by type of traumatic event experienced? An analysis of the Nurses' Health Study II. *Psychological Trauma: Theory, Research, Practice, and Policy*. <http://dx.doi.org/10.1037/tra0000554>
- Lowe, S. R., Manove, E. E., & Rhodes, J. E. (2013). Posttraumatic stress and posttraumatic

- growth among low-income mothers who survived Hurricane Katrina. *Journal of Consulting and Clinical Psychology, 81*(5), 877-889. doi: 10.1037/a0033252
- Lowe, S. R., Rhodes, J. E., Zwiebach, L., & Chan, C. S. (2009). The impact of pet loss on the perceived social support and psychological distress of hurricane survivors. *Journal of Traumatic Stress, 22*(3), 244-247. doi: 10.1002/jts.20403
- Mangelsdorf, J., Eid, M., & Luhmann, M. (2019). Does growth require suffering? A systematic review and meta-analysis on genuine posttraumatic and postecstatic growth. *Psychological Bulletin, 145*(3), 302–338. <https://doi.org/10.1037/bul0000173>
- Mani, A., Mullainathan, S., Shafir, E., & Zhao, J. (2013). Poverty impedes cognitive function. *Science, 341*(6149), 976-980. DOI: 10.1126/science.1238041
- Manove, E. E., Poon, C. Y. S., Rhodes, J. E., & Lowe, S. R. (2021). Changes in psychosocial resources as predictors of posttraumatic growth: A longitudinal study of low-income, female Hurricane Katrina survivors. *Traumatology, 27*(4), 346-353. <https://doi.org/10.1037/trm0000318>
- Measham, T., Guzder, J., Rousseau, C., Pacione, L., Blais-McPherson, M., & Nadeau, L. (2014). Refugee children and their families: Supporting psychological well-being and positive adaptation following migration. *Current Problems in Pediatric and Adolescent Health Care, 44*(7), 208-215. doi: 10.1016/j.cppeds.2014.03.005
- Normand, A. & Sommet, N. The cognitive load of poverty: From attention mechanisms to the role of income inequality. *21st European Social Cognition Network (ESCON 2019)*, ESCON; LabPsy EA 4139; Université de Bordeaux, Sep 2019, Bordeaux, France. ⟨hal-03000809⟩
- Olaya, B., Alonso, J., Atwoli, L., Kessler, R. C., Vilagut, G., & Haro, J. M. (2015).

- Association between traumatic events and post-traumatic stress disorder: results from the ESEMeD-Spain study. *Epidemiology and psychiatric sciences*, 24(2), 172–183.
<https://doi.org/10.1017/S2045796014000092>
- Ong, Q., Theseira, W., & Ng, I. Y. H. (2019). Reducing debt improves psychological functioning and changes decision-making in the poor. *PNAS Proceedings of the National Academy of Sciences of the United States of America*, 116(15), 7244–7249.
<https://doi.org/10.1073/pnas.1810901116>
- Pargament, K., Feuille, M. & Burdzy, D. (2011). The Brief RCOPE: Current psychometric status of a short measure of religious coping. *Religions*, 2(1), 51-76.
<https://doi.org/10.3390/rel2010051>
- Parkes, C. M. (1988). Bereavement as a psychosocial transition: Processes of adaptation to change. *Journal of social issues*, 44(3), 53-65. <https://doi.org/10.1111/j.1540-4560.1988.tb02076.x>
- Porter, M. & Haslam, N. (2005). Predisplacement and postdisplacement factors associated with mental health of refugees and internally displaced persons: A meta-analysis. *Journal of the American Medical Association*, 294(5), 602-612.
doi:10.1001/jama.294.5.602
- Powell, S., Rosner, R., Butollo, W., Tedeschi, R. G., & Calhoun, L. G. (2003). Posttraumatic growth after war: A study with former refugees and displaced people in Sarajevo. *Journal of Clinical Psychology*, 59(1), 71-83. <https://doi.org/10.1002/jclp.10117>
- Raker, E. J., Lowe, S. R., Arcaya, M. C., Johnson, S. T., Rhodes, J., & Waters, M. C. (2019).

- Twelve years later: The long-term mental health consequences of Hurricane Katrina. *Social Science & Medicine*, 242, 112610.
<https://doi.org/10.1016/j.socscimed.2019.112610>
- Rzeszutek, M. & Gruszczynska, E. (2021). Trajectories of posttraumatic growth following HIV infection: Does one PTG pattern exist? *Journal of Happiness Studies*, 23, 1653-1668. <https://doi.org/10.1007/s10902-021-00467-1>
- Sleijpen, M., Haagen, J., Mooren, T., & Kleber, R. J. (2016). Growing from experience: An exploratory study of posttraumatic growth in adolescent refugees. *European Journal of Psychotraumatology*, 7(1), 28698. doi: 10.3402/ejpt.v7.28698
- Slopen, N., Meyer, C., & Williams, D.R. (2018). Cumulative stress and health. In C.D. Ryff and R.F. Krueger (Eds.), *The Oxford Handbook of Integrative Health Science* (pp 76-86). Oxford University Press. DOI: 10.1093/oxfordhb/9780190676384.013.5
- Tabachnick, B. G., & Fidell, L. S. (2007). *Using Multivariate Statistics* (5th ed.). New York: Allyn and Bacon.
- Tedeschi, R. G. & Calhoun, L. G. (2004). Posttraumatic growth: Conceptual foundations and empirical evidence. *Psychological Inquiry*, 15(1), 1-18.
https://doi.org/10.1207/s15327965pli1501_01
- Teodorescu, D. S., Siqueland, J., Heir, T., Hauff, E., Wentzel-Larsen, T., & Lien, L. (2012). Posttraumatic growth, depressive symptoms, posttraumatic stress symptoms, post-migration stressors and quality of life in multi-traumatized psychiatric outpatients with a refugee background in Norway. *Health and Quality of Life Outcomes*, 10(1), 84. doi: 10.1186/1477-7525-10-84
- Triplett, K. N., Tedeschi, R. G., Cann, A., Calhoun, L. G., & Reeve, C. L. (2012).

- Posttraumatic growth, meaning in life, and life satisfaction in response to trauma. *Psychological Trauma: Theory, Research, Practice, and Policy*, 4(4), 400-410. <https://doi.org/10.1037/a0024204>
- Tsai, J. & Pietrzak, R. H. (2017). Trajectories of posttraumatic growth among US military veterans: A 4-year nationally representative, prospective cohort study. *Acta Psychiatrica Scandinavica*, 136, 483-492. doi: 10.1111/acps.12800
- Tsai, J., Sippel, L. M., Mota, N., Southwick, S. M. & Pietrzak, R. H. (2016). Longitudinal course of posttraumatic growth among U.S. military veterans: Results from the National Health and Resilience in Veterans Study. *Depression and Anxiety*, 33, 9-18. DOI 10.1002/da.22371
- UCLA Statistical Consulting Group. (2021). *Multinomial Logistic Regression: SPSS Annotated Output*. Retrieved from: <https://stats.oarc.ucla.edu/spss/output/multinomial-logistic-regression/>
- United States Global Change Research Program (2017). *Climate Science Special Report: Fourth National Climate Assessment, Volume I*. In D. J. Wuebbles, D. W. Fahey, K. A. Hibbard, D. J. Dokken, B. C. Stewart, & T. K. Maycock (Eds.). U.S. Global Change Research Program, Washington, DC, USA, 470 pp, doi: 10.7930/J0J964J6
- Weiss, D. S., & Marmar, C. R. (1996). The Impact of Event Scale - Revised. In J. Wilson & T. M. Keane (Eds.), *Assessing psychological trauma and PTSD* (pp. 399-411). New York: Guilford.
- Workman, M. (2016). Cognitive styles and the effects of stress from cognitive load and time

pressures on judgmental decision making with learning simulations: Implications for HRD. *International Journal of Human Resources Development and Management*, 16(1–2), 30–46. doi:10.1504/IJHRDM.2016.075370

Zwiebach, L., Rhodes, J., & Roemer, L. (2010). Resource loss, resource gain, and mental health among survivors of Hurricane Katrina. *Journal of Traumatic Stress*, 23(6), 751-758. doi: 10.1002/jts.20579

Table 1. *Predictor Variables Included in Each Multinomial Logistic Regression Model*

	Model 1	Model 2	Model 3	Model 4	Model 5
Neg RCOPE	X			X	X
Pos RCOPE	X			X	X
Neighborhood satisfaction	X			X	X
Purpose in life	X			X	X
SPS (W4)	X			X	X
Overall stressors		X		X	
Financial instability			X		X
Health-related stressors			X		X
Weather-related stressors			X		X
Child-related stressors			X		X

Baseline variables in all models: Age, number of children, Kessler 6 Distress Scale, Social Provisions Scale, Hurricane Katrina stressor exposure, Impact of Event Scale- Revised, marital status, social support benefits.

Neg RCOPE=Brief RCOPE (negative religious coping subscale); Pos RCOPE=Brief RCOPE (positive religious coping subscale); SPS=Social Provisions Scale.

Table 2. *Baseline Demographic Information (N=534)*

	Mean (<i>SD</i>)	N	% of sample
Age (in years)	25.08 (4.45)	-	-
Number of children	1.76 (1.01)	-	-
Psychological distress (K6)	4.96 (4.18)	-	-
Perceived social support (SPS)	17.65 (3.57)	-	-
Hurricane Katrina stressor exposure	3.22 (2.41)	-	-
Posttraumatic stress symptoms (IES-R) @ W4	26.70 (21.02)	-	-
Marital status (no. married/cohabitating)	-	122	22.8%
Receipt of social support benefits (no. yes)	-	388	72.7%
<i>Race/ethnicity</i>			
Non-Hispanic Black	-	426	81.6%
Hispanic/Latinx	-	16	3.0%
Non-Hispanic White	-	54	10.1%
Other	-	9	1.7%

Note: 19 participants were missing data on race/ethnicity; K6: Kessler Psychological Distress Scale; SPS: Social Provisions Scale; IES-R: Impact of Event Scale – Revised

Table 3. *Sample Descriptive Statistics of Predictor Variables*

	Mean (<i>SD</i>)	Range
Psychosocial Resources (W4)		
Purpose in life	17.92 (3.00)	8-21
Perceived social support	17.28 (3.53)	3-24
Neighborhood satisfaction	3.87 (5.79)	1-5
Positive religious coping	16.12 (5.79)	0-21
Negative religious coping	19.20 (3.09)	9-21
Stressors (between W4 and W5)		
Overall stressors	3.90 (2.95)	0-14
Weather-related disaster exposure	0.37 (0.70)	0-5
Financial instability	1.09 (1.59)	0-6
Child-related stress	0.44 (0.68)	0-4
Health-related stressors	2.00 (1.60)	0-8

Table 4. Sociodemographic, Disaster Exposure, Psychological, and Stressor Characteristics of Courses of Posttraumatic Growth

	(1)Consistently High PTG (n=168)	(2) Low & Decreasing PTG (n=204)	(3)Increasing PTG (n=160)	Test of Difference F or X^2	Post Hoc Comparisons
PTGI Score					
Wave 4	76.08 (5.11)	51.75(18.78)	53.39(10.35)	183.07***	1>2&3
Wave 5	73.11 (8.85)	39.98(14.99)	71.40 (8.26)	499.99***	1&3>2
Sociodemographic Characteristics (baseline)					
Age	24.67 (4.38)	25.52 (4.51)	24.94 (4.45)	1.79	NS
Number of children	1.65 (0.89)	1.88 (1.12)	1.73 (0.98)	2.23	NS
Receipt of social benefits ¹	130 (77.4%)	134 (65.7%)	124 (77.5%)	10.40***	2>1&3
Marital status ²	29 (17.3%)	64 (31.4%)	28 (17.5%)	13.19***	2>1&3
Psychosocial Factors (baseline)					
Perceived social support	17.96 (3.27)	17.33 (3.53)	17.72 (3.88)	1.56	NS
Psychological distress (K6)	4.59 (3.96)	4.93 (4.10)	5.39 (4.41)	1.43	NS
Hurricane Katrina Exposure	3.57 (2.43)	3.05 (2.42)	3.09 (2.35)	2.52	1>2
Posttraumatic Stress (W4)	31.20 (22.03)	24.55 (20.53)	26.73 (21.02)	5.66**	1>2&3
Psychosocial Resources (W4)					
Purpose in life	19.10 (2.55)	17.20 (3.09)	17.56 (2.97)	27.79***	1>2&3
Positive RCOPE	18.84 (3.65)	13.99 (6.63)	16.11 (5.11)	43.83***	1>2&3; 3>2
Negative RCOPE	19.18 (3.16)	19.15 (3.13)	19.25 (3.01)	0.05	NS
Perceived social support	18.09 (3.45)	16.67 (3.28)	17.16 (1.22)	7.60**	1>2&3
Neighborhood satisfaction	4.11 (1.23)	3.74 (1.29)	3.78 (1.22)	4.54*	1>2&3
Stressors (between W4 & W5)					
Overall stressors	3.68 (2.71)	4.31 (3.16)	3.61 (2.90)	3.02*	2>1&3
Weather-related disaster exposure	0.36 (0.65)	0.35 (0.70)	0.39 (0.73)	1.53	NS
Financial instability	0.89 (1.44)	1.35 (1.73)	0.98 (1.53)	4.25*	2>1&3
Child-related stressors	0.48 (0.73)	0.47 (0.72)	0.35 (0.56)	1.96	NS
Health-related stressors	1.96 (1.54)	2.14 (1.68)	1.89 (1.55)	1.25	NS

*=significant at .05 level; **=significant at .01 level; ***=significant at .001 level;
PTG=Posttraumatic growth; PTGI=Posttraumatic Growth Inventory; K6=Kessler
Psychological Distress Scale; ¹=N yes (%); ²=N Married/Cohabiting (%);
RCOPE=Religious Coping

Table 5. *Multinomial logistic regression models^a used to predict odds of membership in courses of posttraumatic growth (PTG) relative to the comparison course (N=450)*

	Consistently High PTG ^b	Increasing PTG ^b	Consistently High PTG ^c
Model 1			
Purpose in life	1.24 (1.11-1.38)***	1.01 (0.93-1.10)	1.23 (1.10-1.37)***
Perceived social support	1.11 (1.02-1.20)*	1.05 (0.97-1.13)	1.06 (0.98-1.15)
Neighborhood satisfaction	1.22 (0.98-1.52)	0.92 (0.76-1.12)	1.32 (1.06-1.65)*
Positive RCOPE	1.18 (1.11-1.25)***	1.07 (1.02-1.11)**	1.11 (1.04-1.18)***
Negative RCOPE	1.03 (0.95-1.12)	1.03 (0.95-1.12)	1.00 (0.92-1.09)
Model 2			
Overall stressors	0.90 (0.83-0.98)**	0.90 (0.83-0.98)*	0.99 (0.91-1.09)
Model 3			
Weather-related disaster exposure	1.16 (0.83-1.62)	1.14 (0.81-1.61)	1.02 (0.71-1.45)
Financial instability	0.78 (0.67-0.92)**	0.88 (0.75-1.03)	0.89 (0.75-1.06)
Child-related stressors	1.17 (0.82-1.67)	0.92 (0.64-1.34)	1.27 (0.86-1.87)
Health-related stressors	0.89 (0.76-1.04)	0.88 (0.75-1.03)	1.01 (0.85-1.20)
Model 4			
Purpose in life	1.23 (1.10-1.37)***	1.00 (0.92-1.09)	1.23 (1.10-1.37)***
Perceived social support	1.10 (1.02-1.20)*	1.04 (0.97-1.13)	1.06 (0.98-1.15)
Neighborhood satisfaction	1.24 (0.99-1.55)	0.94 (0.78-1.14)	1.32 (1.06-1.65)*
Positive RCOPE	1.18 (1.11-1.25)***	1.07 (1.02-1.12)**	1.10 (1.04-1.17)***
Negative RCOPE	1.02 (0.94-1.10)	1.02 (0.94-1.10)	1.00 (0.92-1.09)
Overall Stressors	0.91 (0.83-0.99)*	0.91 (0.83-0.99)*	1.00 (0.91-1.10)
Model 5			
Purpose in life	1.22 (1.10-1.36)***	1.00 (0.92-1.09)	1.23 (1.10-1.37)***
Perceived social support	1.10 (1.01-1.20)*	1.03 (0.97-1.13)	1.06 (0.97-1.15)
Neighborhood satisfaction	1.22 (0.97-1.53)	0.93 (0.77-1.13)	1.32 (1.05-1.64)*
Positive RCOPE	1.20 (1.12-1.26)***	1.07 (1.02-1.12)*	1.11 (1.04-1.18)***
Negative RCOPE	1.01 (0.93-1.09)	1.01 (0.93-1.10)	0.99 (0.91-1.08)
Weather-related disaster exposure	1.10 (0.77-1.57)	1.14 (0.80-1.62)	0.96 (0.67-1.39)
Financial instability	0.82 (0.69-0.99)*	0.88 (0.75-1.03)	0.94 (0.77-1.13)
Child-related stressors	1.38 (0.93-2.05)	1.00 (0.68-1.47)	1.38 (0.92-2.07)
Health-related stressors	0.84 (0.71-1.00)	0.87 (0.74-1.02)	0.97 (0.81-1.16)

^aBaseline and exposure variables included in all models: Age, number of children, receipt of social benefits, marital status, perceived social support, psychological distress, Hurricane Katrina exposure, and posttraumatic stress

^bReference group was Low and Decreasing PTG

^cReference group was Increasing PTG

* $p < .05$; ** $p < .01$; *** $p < .001$