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Trajectories of Perceived Social Support Among Low-Income Female Survivors of Hurricane Katrina

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Abstract

The purpose of this study was to explore trajectories of perceived social support among low-income women who survived Hurricane Katrina, and were surveyed prior to the hurricane and approximately one and four years thereafter ($N = 562$). Latent class growth analysis provided evidence of four trajectories of perceived support: *High Increasing* (35.9%), *High Decreasing* (20.3%), *Low Stable* (41.1 %), and *Low Decreasing* (2.7%). Bereavement was significantly predictive of membership in the *Low Stable* trajectory, relative to the *High Increasing* and *High Decreasing* trajectories. Higher psychological distress and indicators of greater social network size, density and closeness were significantly predictive of membership in the *Low Decreasing* trajectory, relative to the *High Increasing* and *High Decreasing* trajectories.

Keywords

Hurricane Katrina; latent class growth analysis; low-income women; natural disasters; perceived social support; psychological distress; social networks

A large body of research has shown that exposure to natural disasters is associated with increases in mental health problems (e.g., Norris et al., 2002; Galea et al., 2007). As such, researchers have sought to identify factors associated with postdisaster mental health. One factor that has been consistently associated with more favorable postdisaster psychological outcomes is *perceived social support*, defined as the belief that assistance would be available if needed and the general sense of being connected to others (Kaniasty & Norris, 2009; Sarason, Sarason, & Pierce, 1990). Perceived social support is thought to be more directly related to postdisaster mental health than *received support*, or actual assistance from others (Kaniasty & Norris, 2005). Given the benefits of perceived social support to postdisaster mental health, it is important to understand what factors might shape this resource in the aftermath of disaster.

Trajectories of Social Support

Although perceived social support has often been conceptualized as a stable psychosocial resource, longitudinal studies have shown it to be dynamic and affected by changing

external circumstances (Hobfoll, Johnson, Ennis, & Jackson, 2003). In the aftermath of disasters, for example, studies have shown that, whereas received support tends to increase in the initial aftermath, perceived support tends to decrease over time (e.g., Kaniasty & Norris, 1995; Norris, Baker, Murphy, & Kaniasty, 2005).

It is important to note, however, that there is marked variation among individuals in postdisaster perceived social support, such that some survivors maintain high levels and others experience steep declines (Kaniasty & Norris, 2009). Variation in patterns of perceived social support over time can be understood through the framework of Conservation of Resources (COR) theory (Hobfoll, 1989). COR theory posits that individuals strive to collect and maintain valued resources, or “objects, personal characteristics, conditions, and energies” (p. 516). Resources under COR are therefore not limited to financial or material resources, but also include psychosocial resources, among them perceived social support (Hobfoll et al., 2003). Psychological stress, according to COR theory, is the result of actual or threatened loss of resources. External stressors, such as natural disasters, are thought to lead to adverse psychological outcomes through loss of resources, and empirical research to date has provided evidence for this indirect pathway (e.g., Smith & Freedy, 2000).

Importantly, COR acknowledges that resources are not equally distributed through the population, and that a person’s initial level of resources is related to the extent of resource loss in the face of an external stressor. Individuals lacking resources are especially prone to resource loss after an external stressor, a process termed *loss spirals*. Conversely, those with more resources may be better equipped to cope with external events, protecting against resource loss (Hobfoll & Parris Stevens, 1990). In addition, more stable characteristics that, to at least some extent, underlie psychosocial resources might protect against resource loss after exposure to an external stressor. For example, optimism and assertiveness might act as more stable qualities that help disaster survivors reestablish social support networks and maintain a positive outlook about their relationships, thereby protecting against declines in perceived social support or even facilitating increases in social support (Dougall, Hyman, Hayward, McFeeley, & Baum, 2001; Sarason, Sarason, & Shearin, 1986).

Based on COR theory, one would expect that persons with low predisaster perceived support might be prone to declines in perceived support in the aftermath of a natural disaster, whereas those with high predisaster support would be more likely to have either stable or increasing levels of postdisaster support. Studies to date, however, have been unable to test this expectation and, more generally, to document distinct pre to postdisaster trajectories of perceived social support, primarily due to a lack of predisaster data (Norris et al., 2002).

Even in studies with predisaster data, different patterns of growth and decline in social support have not been demonstrated due to a reliance on statistical techniques that assume that all participants come from the same population and are affected by covariates in the same way (Andruff, Carraro, Thompson, Gandreau, & Louvet, 2009; Jung & Wikrama, 2008). These assumptions are at odds with theoretical frameworks and research findings that posit subpopulations that respond to external stressors in different ways (Jung & Wickrama, 2008; Luthur & Cushing, 1999). An alternative approach is Latent Class Growth Analysis

(LCGA), a person-centered technique. LCGA has been used to demonstrate distinct trajectories of psychological functioning in the aftermath of disasters (e.g., Nandi, Tracy, Beard, Vlahov, & Galea, 2009; Norris, Tracy, & Galea, 2009). To our knowledge, however, LCGA analysis has not been utilized to explore trajectories of social support.

Predictors of Social Support Trajectories

Subpopulations with distinct patterns of responses to external stressors are also thought to vary on different dimensions (Jung & Wikrama, 2008). Similarly, COR theory and empirical findings to date suggest a host of factors that might predict different patterns of perceived social support in the context of disasters. These predictors fall roughly into four categories: demographic characteristics, disaster exposure, psychological distress, and social network characteristics.

Demographic characteristics

First, as mentioned above, COR theory recognizes that resources are not equally distributed and posits that individuals and groups lacking resources are prone to further resource loss, through *loss spirals*. It follows that demographic groups that generally have access to fewer resources might be more prone to pre to postdisaster declines in perceived social support. Although no studies have documented demographic variation in pre to postdisaster changes in support, cross-sectional postdisaster studies have documented lower perceived social support among racial minorities and older adults, relative to their counterparts (Kaniasty & Norris, 1995; Norris et al., 2005). It is therefore possible that members of disadvantaged groups might be overrepresented in trajectories of either stably low or declining perceived support.

Disaster exposure

Second, an additional facet of COR theory not yet discussed is that higher levels of external stress exposure are associated with greater losses in resources (Hobfoll, 1989). Previous findings have linked greater exposure to hurricane-related stressors and steeper pre to postdisaster declines in perceived social support (e.g., Kaniasty & Norris, 1993), yet it remains unknown whether hurricane exposure is predictive of membership in distinct trajectories of support. Stressors endured during disasters that directly threaten social support might be especially likely to yield trajectories characterized by pre to postdisaster declines in perceived social support (Grandley & Cropanzano, 1999). For example, disaster survivors who have experienced bereavement have been found to be at greater risk for postdisaster distress (e.g., Gibb, 1989), which might be due to decreased perceptions of support. Disaster survivors who have experienced greater property damage have also been shown to be at greater risk for postdisaster distress (e.g., Marshall, Schell, Elliot, Rayburn, & Jaycox, 2007). Again, this could be in part due to declines in social support, as attending to property damage and insurance claims could interfere with support processes. Survivors with extensive property damage might also be likely to experience prolonged displacement, which could further disrupt social support perceptions. In this vein, previous findings have linked residential mobility with decreased social support and increased stress (e.g., Magdol, 2002; Magdol & Bessel, 2003).

Psychological distress

Third, trajectories of perceived social support are likely related to pre and postdisaster psychological distress. Although research to date has predominantly conceptualized perceived support as a predictor of postdisaster mental health, relationships between social support and psychological distress are theoretically bidirectional. On one hand, a core element of COR theory is that loss of resources leads to psychological stress, termed *social causation* (Dohrenwend, 2000). On the other, psychological distress could undermine perceived social support and other resources, termed *social selection* (Dohrenwend, 2000). A multi-wave postdisaster study indeed found that the relationships between perceived support and distress reflected both social causation and social selection (Kaniasty & Norris, 2008). As such, higher levels of psychological distress are likely related to low and decreasing trajectories of support.

Social support networks

Lastly, trajectories of perceived social support are likely influenced by characteristics of disaster survivors' support networks. Although this topic has not been explored empirically, the characteristics of social networks that have been linked to lower perceived social support in cross-sectional studies might be present in consistently low or decreasing trajectories. For example, smaller networks have been associated lower perceived support (Stephens, Alpass, Towers, & Stevenson, 2011). Other research has looked at the *density* of social networks – that is, how interconnected the network is – and has found that less dense networks are associated with a lower sense of social connectedness (Ashida & Heaney, 2008). One cross-sectional study found that network size and density were positively associated with support provided to others in the aftermath of Hurricane Andrew, indicating these as qualities that influence postdisaster support processes (Haines, Hurlbert, & Beggs, 1996). Lastly, the level of closeness an individual has with network members could influence support trajectories. Having network members that are considered confidants, to whom an individual can disclose personal information, has been associated with lower feelings of loneliness (Berg & McQuinn, 1989; Stokes & Levin, 1986), and more frequent contact with network members, perhaps another indicator of closeness, has been linked to greater perceived support (Ashida & Heaney, 2008).

The Current Study

In summary, research suggests that perceptions of social support decline in the longer-term aftermath of disaster, but that there is substantial variation in perceived support among survivors. Studies to date have not documented distinct pre to postdisaster trajectories of perceived support, however. The primary purpose of the study was to fill this gap by conducting a LCGA of perceived social support using data from a three-wave study of low-income women who survived Hurricane Katrina, with one predisaster and two postdisaster waves of data. COR theory suggests postdisaster trajectories of support stem directly from their predisaster levels, such that those with lower levels are prone to steeper declines, whereas those with higher levels are more likely to have stable or increasing trajectories. However, we made no a priori hypotheses about the number and nature of the trajectories in the sample based on the lack of research in this area.

Moreover, prior theory and research indicate that other factors beyond predisaster levels of support may influence both the shape of and membership in pre to postdisaster trajectories. As such, the secondary purpose of the study was to explore associations between four categories of predictors and trajectory membership. Based on previous research, we expected that demographic characteristics associated with fewer resources, indicators of greater disaster exposure, higher psychological distress, and less favorable social network characteristics to be predictive of membership in trajectories with stably low or decreasing support. However, given that we had no a priori hypotheses regarding the results of the LCGA, these too should be considered exploratory analyses.

Methods

Participants and Procedure

Participants were initially part of a study of low-income parents who had enrolled in three community colleges in the city of New Orleans in 2004–2005. The purpose of this study was to examine whether performance-based scholarships affected the academic achievement and physical and mental health of low-income parents (Richburg-Hayes et al., 2009). To be eligible, students had to be between the ages of 18 and 34; be parents of at least one dependent child under 19; have a household income under 200 percent of the federal poverty level; and have a high school diploma or equivalent. Students were recruited through a general marketing and outreach campaign, which included flyers, newspaper and radio announcements, and oral presentations in mandatory orientation and testing sessions for incoming freshman. Between November 2003 and August 2005 (Time 1; T1), 1,019 participants at the three community colleges enrolled in the study. Prior to random assignment, participants completed a brief survey that included demographic information (e.g., age, race/ethnicity) and measures of perceived social support and psychological distress. Participants were then randomly assigned to either the Opening Doors Program, which included extra student advising and a \$1,000 stipend for each semester enrolled, or a control condition, which included neither of these benefits.

Hurricane Katrina made landfall on August 29, 2005 and led to structural damage at the three community colleges, each of which was closed for the Fall 2005 semester. Because of this, the community colleges were withdrawn from the original study, and participants in the Opening Doors program received no further benefits. The research team secured funding to follow-up with participants from the New Orleans community colleges as part of a new study on postdisaster adjustment, however. The researchers made efforts to locate all participants, irrespective of whether they had been assigned to the Opening Doors Program or the control condition. Between May 2006 and March 2007, 711 of the 1019 participants (69.8%) completed the first postdisaster survey (Time 2; T2), which included the same questions as the baseline survey and a module of hurricane experiences. At T2, the researchers also accessed flood depth information for participants' predisaster addresses. Between March 2009 and June 2010, 720 participants (70.7% of 1,019) completed a second postdisaster survey, which included the same questions as previous waves and an additional module on social networks. Trained researchers administered the T2 and T3 surveys, and compensated participants with \$50 gift cards for their participation at each wave. All

participants provided written consent to be part of the original study, and verbal consent to participate in the post-disaster surveys. Institutional Review Boards of Harvard University, Princeton University, University of Massachusetts Boston, and Washington State University approved the study.

In the current study, only participants who completed all three waves were included ($n = 600$). A subsample of male participants ($n = 37$) was dropped in light of consistent findings of gender differences in psychological distress following natural disasters (e.g., Norris et al., 2002). Of the remaining 563 female participants, one case that was missing both assessments of postdisaster support was dropped, leaving a final sample of 562 women. Bonferroni-corrected independent-samples t -tests and chi-square tests detected no significant differences between included and excluded participants on any of the variables included in the study. For the 562 included cases, 2.4% of the data were missing and, among the variables in the analysis, missingness ranged from 0.0% to 12.3%. Bonferroni-corrected independent-samples t -tests and chi-square tests detected the following differences between complete cases ($n = 409$; 72.8%) and cases with missing data ($n = 153$; 27.2%): complete cases were significantly more likely to have experienced bereavement and to be employed at T2. Multiple Imputation by Chained Equations (MICE) (Allison, 2002) was used to handle missing data. Ten complete datasets were imputed and the results represent the average of ten separate analyses with Rubin's (1987) correction of standard error.

The mean age of the 562 women at baseline was 25.19 ($SD = 4.52$) and their average number of children at T1 was 1.80 ($SD = 1.03$). Most participants (84.8%) self-identified as non-Hispanic Black, 9.9% as White, 3.1% as Hispanic, and 2.2% as "other." At T1, 12.6% were either married and living with a spouse or partner, whereas 39.7% and 14.8% were at T2 and T3, respectively. After the T1 assessment, about half of the participants (51.6%) had been assigned to the Opening Doors program, and 48.4% to the control condition.

Measures

Perceived social support—The Social Provisions scale (SPS; Cutrona & Russell, 1987) assessed perceived social support at each wave. The SPS was designed to assess relational provisions identified by Weiss (1974). Instead of the full scale, which consists of six four-item subscales each, an 8-item version was used. The shortened version included two items from four of the six original subscales: *Social Integration* (e.g., "I am with a group of people who think the same way I do about things"), *Reassurance of Worth* (e.g., "There are people who value my skills and abilities"), *Guidance* (e.g., "I have a trustworthy person to turn to if I have problems"), and *Reliable Alliance* (e.g., "There are people I know will help me if I really need it"). The full scale was not employed to reduce the burden on participants, with the intention of increasing retention in the study. The retained items were selected a priori because they aligned with the goals of the Opening Doors program, which was to increase community college students' sense of social integration, connection, and guidance from their community colleges. Items were rated using a 4-point Likert-type scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*), and half of the items were reverse scored. Cutrona (1989) provided evidence for the validity of the SPS among young mothers, and reliability for the full scale in a previous study was Cronbach's alpha of .92 (Cutrona, Russell, & Rose,

1986). Cronbach's alpha the current study ranged from .79 to .81 (T1: $M = 2.18$, $SD = 0.45$; T2: $M = 2.19$, $SD = 0.47$; T3: $M = 2.17$, $SD = 0.45$).

Demographic characteristics—Participants' age at baseline, race/ethnicity, and employment status at each wave were included, since these characteristics have been shown to influence post-disaster perceived social support (e.g., Kaniasty & Norris, 1995; Norris et al., 2002). We also included assignment to the Opening Doors program as a dummy-coded variable, given that the program provided participants with financial benefits and aimed to increase students' perceived social support.

Disaster exposure—Three variables were included as indicators of disaster exposure. First, floodwater depth corresponding to participants' predisaster address was included as a proxy for damage to participants' predisaster homes ($M = 18.29$ inches, $SD = 26.46$; Range: 0–116). Second, a dummy variable indicating whether participants had lost a family member or close friend due to the hurricane and its aftermath (*bereavement*; 33.3%) was included. Lastly, we included a dummy variable for whether respondents had returned to the New Orleans Metropolitan Statistical Area (MSA) by T3 (51.0%).

General psychological distress—The K6 scale, a six-item screening measure of nonspecific psychological distress (Kessler et al., 2003), assessed psychological distress at each wave. This scale has been shown to have good psychometric properties (Furukawa, Kessler, Slade, & Andrews, 2003) and has been used previously in disaster research (e.g., Galea et al., 2007). Participants rated items (e.g., “During the past 30 days, about how often did you feel so depressed that nothing could cheer you up?”) on a 5-point Likert-type scale ranging from 0 (*none of the time*) to 4 (*all the time*). The sum of the six items was used in the analysis. Cronbach's alpha in the current study ranged from .78 to .80 (T1: $M = 4.93$, $SD = 4.13$; T2: $M = 6.31$, $SD = 4.92$; T3: $M = 5.65$, $SD = 4.88$).

Social network characteristics—Characteristics of participants' social networks were assessed at T3 using items from the 2004 General Social Survey (Smith, Marsden, Hout, & Kim, 2011). Participants were asked, “Over the last six months, who are the people with whom you discussed matters important to you?” Participants could list up to five names, and the total number of contacts that each participant listed served as a rough measure of *Network Size* (McPherson, Mill, Smith-Lovin, & Brashears, 2006) ($M = 2.13$, $SD = 1.43$; Range: 0–5).

Two measures were used to capture the density of participants' social networks, and were only available for participants who had listed more than one network member ($n = 354$). The first measure was labeled *Density of Contacts*. For each pair of contacts listed, participants indicated whether the pair was “especially close, neither total strangers nor especially close, or total strangers.” “Especially close” responses were given a value of 1, “not especially close” a value of .5, and “total strangers” a value of 0. These values were averaged across the total number of contact pairs for each participant, with values closer to 1 indicating greater density ($M = .81$, $SD = .27$). The second measure, labeled *Few or No Friends Know Each Other*, was included as an additional rough indicator of network density. Participants indicated how many of their friends – not just listed network members – know each other,

from *none* to *all*. We included dummy variable to indicate whether respondents reported that few or none of their friends know each other (22.2% fit this criterion).

Participants who listed more than one contact ($n = 354$) were also asked if they were “equally close” to each contact (85.0% answered “Yes”), and a dummy variable was included as an indicator of relationship closeness (*Equally Close With All Contacts*). Notably, in creating this indicator, we assumed that participants who reported that they were “equally close” to their contacts would have higher levels of closeness to each network member than those who reported that they were not “equally close.” It is certainly possible, however, that participants could have equally *low* levels of closeness to their listed contacts. Therefore, this variable should be considered a rough indicator of relationship closeness at best. Dummy-coded variables for whether participants were living with a spouse or partner at each time were also included as an indicator of relationship closeness. The rationale here was that cohabiting participants might be more likely to have regular contact with at least one close confidant than those who were either single or living separately from their partners.

Data Analysis

Data analysis consisted of two main steps. First, we conducted LCGA in Mplus 7.1 (Muthén & Muthén, 1998–2012) to explore trajectories of perceived social support. Models with one to five classes, linear effects, and both linear and quadratic effects were tested, yielding a total of ten models. Variances and covariances of growth factors within each trajectory were constrained at zero to facilitate model convergence (Jung & Wickrama 2008). As there is no definitive test for determining which model best represents the data, we followed recommended practices by taking into account statistical criteria, the substantive meaning of each solution, theory, and parsimony (Berlin, Williams, & Parra, 2014; Masyn, 2013; Nylund, Asparouhov, & Muthén, 2007). Statistical criteria assessed included the Bayesian Information Criterion (BIC), adjusted BIC, and consistent Akaike’s Information Criterion (CAIC), information criteria-based fit statistics, with lower values indicating better fit; and entropy and average posterior probability, both measures of classification accuracy ranging from 0 to 1, with higher values indicating greater accuracy (Masyn, 2013). The Lo-Mendel-Rubin adjusted likelihood ratio test (LMR-LRT) and bootstrap likelihood ratio test (BLRT), which compares a model with k profiles to a model with $k-1$ profiles, were unavailable in Mplus 7.1 with the use of multiple imputations and therefore are not referenced. After the model that best represented the data was selected, descriptive analyses for participants with most likely membership in each latent trajectory were conducted in Stata 12.1 (StatCorp, 2011). Additionally, paired-samples t -tests assessed changes in support from T1 to T2, and from T2 to T3, within each trajectory, and independent-samples t -tests examined differences in support between adjacent groups at each wave.

Second, after the model that best represented the data was selected, we used the three-step approach proposed by Vermunt (2010) to explore associations between each predictor variable and latent class membership in Mplus 7.1. This analytic approach is similar to multinomial logistic regression, but accounts for the classification uncertainty rate in the LCGA model (Asparouhov & Muthén, 2013). This technique could not be performed for the

three social network characteristic variables that were only available for the subsample of participants who listed more than one contact. These variables were explored as predictors of class membership through standard multinomial logistic regression in Mplus 7.1.

Results

Trajectories of Social Support

The results of the LCGA models are listed in Table 1. The smallest BIC, adjusted BIC, and CAIC values were found in the four- and five-class models containing linear and quadratic effects. Although the five-class model had higher entropy and average posterior probabilities than the four-class model, the smallest class in the five-class model consisted of only five participants, or 0.9% of the sample. Additionally, when plots of the trajectories within the two solutions were inspected, two of the trajectories in the five-class model had similar patterns of growth over the study, both starting with relatively high social support that was stable between T1 and T2 and then decreased between T2 and T3. Lastly, Scree plots of the BIC, adjusted BIC and CAIC suggested an “elbow point” at the four-class solution, indicating minimal gains in model fit thereafter. Based on these considerations, we selected the more parsimonious four-class model as the best representation of the data.

The four trajectory groups were given descriptive names based on patterns of growth and decline over the course of the study: *High Increasing*, *High Decreasing*, *Low Stable*, and *Low Decreasing*. Mean perceived social support scores for the four trajectories at each time point are shown in Figure 1. Table 2 also includes means and standard deviations, as well as the results of paired- and independent-samples *t*-tests.

Participants in the *High Increasing* trajectory ($n = 203$, 35.9%) started with relatively high perceived social support that did not significantly change between T1 and T2, and significantly increased from T2 to T3. In contrast, perceived social support in the *High Decreasing* trajectory ($n = 118$, 20.3%) significantly decreased from T1 to T2, and from T2 to T3. Whereas *High Decreasing* participants had significantly higher support than *High Increasing* participants at T1, the two trajectories did not differ in support at T2, and *High Decreasing* participants had significantly lower support than *High Increasing* participants at T3.

For the participants in the *Low Stable* trajectory ($n = 226$, 41.1%), perceived social support did not significantly change from T1 to T2, or from T2 to T3. *Low Stable* participants had significantly lower perceived support than *High Decreasing* participants at all three time points. Perceived social support for the *Low Decreasing* participants ($n = 15$, 2.7%) did not significant change from T1 to T2, but significantly decreased from T2 to T3. The *Low Decreasing* trajectory had significantly lower support than the *Low Stable* trajectory at T3, but not at T1 or T2.

Predictors of Trajectory Membership

Descriptive data on demographic characteristics, hurricane experiences, social network characteristics, and psychological distress for each trajectory, as well as the results of

analyses assessing each variable as a predictor of latent class membership, are presented in Table 3.

Demographic characteristics—T3 employment and Opening Doors status were significant predictors of trajectory membership. T3 employed participants were significantly more likely to be in the *High Increasing* trajectory, relative to the *Low Stable* trajectory. Opening Doors participants were significantly more likely to be in the *High Increasing* and *High Decreasing* trajectories, relative to the *Low Stable* trajectory. Participant age, race/ethnicity, and T1 and T2 employment were not significant predictors of trajectory membership.

Disaster exposure—Bereavement was a significant predictor of trajectory membership, such that participants who experienced the loss of a close friend or family member due to the hurricane were significantly more likely to be in *Low Stable* trajectory, relative to the *High Increasing* and *High Decreasing* trajectories. Flood depth and T3 residence in New Orleans were not significant predictors of trajectory membership.

Psychological distress—At each wave, higher psychological distress was a significant predictor of being in the *Low Decreasing* and *Low Stable* trajectories, relative to the *High Increasing* and *High Decreasing* trajectories. Additionally, higher psychological distress at T1 was significantly associated with being in the *High Decreasing* trajectory, relative to the *High Increasing* trajectory, and higher psychological distress at T2 was significantly associated with being in the *Low Decreasing* trajectory, relative to the *Low Stable* trajectory.

Social network characteristics—Listing more social network members was a significant predictor of membership in the *High Increasing*, *High Decreasing*, and *Low Stable* trajectories, relative to the *Low Decreasing* trajectory, as well as the *High Increasing* trajectory, relative to the *Low Stable* and *High Decreasing* trajectories. Both indicators of network density were also significantly associated with trajectory membership. Higher *Density of Contacts* was significantly predictive of membership in the *High Increasing*, *High Decreasing*, and *Low Stable* trajectories, versus the *Low Decreasing* trajectory, whereas endorsing the *Few or No Friends Know Each Other* item was significantly predictive of membership in the *Low Decreasing* trajectory, versus the *High Increasing* and *High Decreasing* trajectories. Indicators of relationship closeness were also significant predictors of trajectory membership. Participants endorsing the *Equally Close With All Contacts* item were significantly more likely to be in the *High Increasing* and *High Decreasing* trajectories, relative to the *Low Decreasing* trajectory. Living with a spouse or partner at T2 was also a significant predictor of membership in the *High Increasing* trajectory, relative to the *Low Stable* trajectory. Living with a spouse or partner at T1 or T3, however, did not significantly predict trajectory membership.

Discussion

The purpose of this study was to explore trajectories of perceived social support among low-income women who survived Hurricane Katrina, and to examine demographic and social network characteristics, disaster exposure, and psychological distress as predictors of

trajectory membership. Participants were part of a randomized controlled study of a community college intervention that was interrupted by the hurricane, and completed assessments of perceived social support prior to the hurricane and approximately one and four years thereafter. Using latent class growth analysis (LCGA), we detected four distinct trajectories of perceived social support: *High Increasing* (35.9%), *High Decreasing* (20.3%), *Low Stable* (41.1%), and *Low Decreasing* (2.7%).

We documented several significant predictors of trajectory membership. Of the demographic characteristics, employment at the four-year postdisaster assessment was significantly predictive of the *High Increasing* trajectory (versus the *Low Stable* trajectory), and predisaster assignment to the community college intervention was significantly predictive of the *High Increasing* and *High Decreasing* trajectories (versus the *Low Stable* trajectory). In contrast, experiences of bereavement due to the hurricane and its aftermath were associated with a lower likelihood of being in the *High Increasing* and *High Decreasing* trajectories (versus the *Low Stable* trajectory). Psychological distress at each time point was also associated with trajectory membership, and lower levels were consistently predictive of membership *High Increasing* and *High Decreasing* trajectories, relative to the *Low Stable* and *Low Decreasing* trajectories. Finally, less favorable social network characteristics – including indicators of smaller and less dense networks, and less relationship closeness – were significant predictive of membership in the *Low Decreasing* trajectory, relative to other trajectories. Living with a spouse or partner at the one-year postdisaster assessment, also included as an indicator of relationship closeness, was also associated with membership in the *High Increasing* trajectory (versus the *Low Stable* trajectory).

The trajectories detected through LCGA were somewhat consistent with our predictions based on COR theory. For example, the *High Increasing* trajectory demonstrates the possibility that some disaster survivors with high levels of predisaster resources could have postdisaster increases in such resources. This finding is also consistent with the theory of posttraumatic growth (PTG; Tedeschi & Calhoun, 1995), which posits that exposure to traumatic events can lead to gains in various domains, among them relationships with others. The *Low Decreasing* trajectory was also consistent with our expectation based on COR theory that participants with low predisaster perceived social support would be prone to declines postdisaster support, reflective of *loss spirals*. Interestingly, the significant declines in support observed in this group did not emerge immediately, but rather between the two postdisaster assessments. It is possible that this pattern is indicative of the *mobilization-deterioration* trend in support proposed by Kaniasty and Norris (2008). That is, survivors in the *Low Decreasing* group might have experienced normative increases in received support in the early aftermath of the hurricane, protecting them against short-term declines in perceived support. It is noteworthy that the *Low Decreasing* trajectory was only comprised of only 15 participants, and the majority of participants with low predisaster perceived social support fell into the *Low Stable* trajectory. The stability in perceived support among this group, although inconsistent with our expectations, could be indicative some form of resilience (e.g., Cacioppo, Reis, & Zatura, 2011). On the other hand, the presence of a *High Decreasing* trajectory demonstrates that postdisaster declines in support can occur even

among those with high predisaster support and are therefore not always a function of *loss spirals*.

The analyses on predictors of trajectory membership provide insight into factors other than predisaster perceived social support that influenced trajectory membership. Employment at the four-year postdisaster assessment, which was predictive of the *High Increasing* trajectory (relative to the *Low Stable* trajectory), could have yielded higher levels of social support through social connections at work or financial resources that protected against psychosocial resource loss. Employment might have been less influential at the predisaster time point, when participants might have been more focused on educational pursuits, or at the first postdisaster assessment, when participants may have attending to more pressing postdisaster concerns (e.g., housing, children's well-being). In contrast, enrollment in the community college intervention might have been a more important predictor of perceived social support at the predisaster assessment, when all of the participants were community college students. The removal of this resource after the hurricane could perhaps account for decreases in support in the *High Decreasing* trajectory.

Our expectation that greater hurricane exposure would be associated with membership in trajectories with decreasing support was not confirmed. Instead, bereavement was predictive of membership in the *Low Stable* trajectory, relative to the two trajectories that began with high predisaster support. One possible explanation is that experiences of bereavement could have prevented any postdisaster increases in support among participants in the *Low Stable* trajectory. Alternatively, participants lacking predisaster support, as well as their family members and close friends, might have been more vulnerable to life-threatening hurricane-related experiences (e.g., lack of food, water, or medical care) than those with higher predisaster support (Lowe, Chan, & Rhodes, 2010). Consistent with this interpretation, an even greater proportion of participants in the *Low Decreasing* trajectory experienced bereavement. The lack of significant findings regarding bereavement as a predictor of the *Low Decreasing* trajectory, relative to the other trajectories, is likely due to the small number of participants in this subsample, limiting statistical power. Similarly, in assessing the descriptive data, we noted that participants in the *Low Decreasing* trajectory had higher levels of flood depth than those in other trajectories, although flood depth was not a significant predictor of trajectory membership.

The finding that psychological distress at each wave was a robust predictor of trajectory membership was consistent with our expectations. Particularly interesting was that psychological distress at the first postdisaster wave was a predictor of membership in the *Low Decreasing* trajectory, relative to the *Low Stable* trajectory, whereas significant differences in perceived social support between these trajectories did not emerge until the second postdisaster wave. This pattern of results could indicate that *social selection* was occurring. However, longitudinal cross-lagged models that include social support and psychological distress will be needed to more directly examine social selection and social causation in the context of disasters, building off of the work of Kaniasty and Norris (2008).

There are several possible explanations for our finding that less favorable social network characteristics (smaller network size, less network density, and less relationship closeness)

at the second postdisaster wave were predictive of the *Low Decreasing* trajectory. Participants with smaller networks could have had fewer people to turn to for support or lack social skills necessary to building and maintaining social relationships. Those with less dense networks might have been less likely to have network members rally behind them in times of need. Lack of relationship closeness could be indicator of postdisaster strain in relationships, or a general tendency to be in conflicted relationships or to appraise relationships negatively. The results regarding cohabitation with a spouse or partner could indicate that intimate partner relationships are especially important to perceptions of support in the early stages of disaster recovery.

Future Directions

Replication in other disaster-exposed samples is needed, especially given the exploratory nature of the current study. Future studies could include other factors that likely influence pre to postdisaster trajectories of perceived support, including the frequency and quality of social interactions and more stable personality characteristics (e.g., optimism and assertiveness). Other predictors that are especially relevant to postdisaster support, such as identification with a community of survivors and volunteer work, could also be incorporated (e.g., Morris, Campbell, Dwyer, Dunn, & Chambers, 2011; Pilkington, Windsor, & Crisp, 2012). Studies could explore how trajectories of perceived support relate to PTG, particularly the growth in relationships with others domain. Lastly, further research would benefit from access to additional waves of data. Since the study only included three waves, the variances and covariances of growth factors within each trajectory were fixed at zero to facilitate model convergence. With additional assessments, these parameters could be freed, permitting exploration of how predictors influence initial levels and changes in perceived support *within* each trajectory.

Implications

The results suggest the importance of assessing disaster survivors' perceptions of support in clinical interventions. For survivors perceiving little support, clinicians could work with survivors to critically evaluate whether their perceptions align with reality, enrich existing relationships or promote new ones, and foster improved interpersonal skills. If it is evident that a survivor's relationships are strained, clinicians could engage loved ones in treatment (e.g., Wells, 2006). It would also be important to help survivors cope with postdisaster grief reactions, both in response to bereavement and relationships damaged beyond repair, and with experiences of prolonged separation from loved ones. Clinicians should also strive to target populations lacking support through outreach efforts. For example, outreach materials could include feelings of social isolation in a list of common postdisaster reactions, or provide information on what to do if a loved one has become distant or estranged. The results also support policies that strengthen communities. For example, the Greater New Orleans Health Planning Group (2005) listed recommendations to enhance social support through rebuilding efforts, including the creation of playgrounds and community centers, reestablishment of key predisaster social institutions (e.g., churches, neighborhood associations), and the formation neighborhood committees to guide local decision-making. Further initiatives that strengthen perceptions of support, such as mentoring programs and

volunteer opportunities, should also be supported (e.g., Pilkington et al., 2012; Wheeler, Keller, & DuBois, 2010).

Limitations

There are several notable limitations to the current study. We did not distinguish among types of perceived social support (e.g., emotional, informational, tangible), nor did we include indices of received support and support provided to others. Future studies that evaluate trajectories of various forms of support, and relationships among them, would provide greater insight into how postdisaster support processes unfold. We also only had access to social network data at the four-year postdisaster assessment, limiting our ability to investigate whether predisaster network characteristics and changes in social networks influenced trajectories membership. Our indicators of relationship closeness were rough, and more in-depth assessments of closeness with each network member would be useful in future research. Information about participants' broader social networks, not limited to those with whom they discuss important matters, would also be of value, particularly since a sizeable proportion of the participants in the current study listed only one network member. We also included a measure of nonspecific psychological distress as a predictor of trajectory membership, rather than indices of more specific symptoms that are common in the aftermath of disasters, such as posttraumatic stress, depression, and grief reactions. Similarly, other hurricane-related stressors that could affect perceived social support, including prolonged separations from loved ones, were not included. It is also worth noting that LCGA model selection involves some subjectivity, although we based our decision on statistical indices, prior research, and theory. Lastly, although our focus on an at-risk population was a strength of the study, the specific nature of our sample limits its generalizability. Since all of the women were community college students at baseline, the results do not represent the experiences of all low-income mothers who endured Hurricane Katrina.

Despite these limitations, the results of the study demonstrate the various patterns of perceived social support that occur in the aftermath of disasters, and their relationship with demographics, hurricane-related stressors, social network characteristics, and psychological distress. The findings suggest that interventions and policies that promote postdisaster social support could also protect against adverse psychological reactions.

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Figure 1.
Observed Means of Perceived Social Support for the Four Trajectories Over the Course of the Study ($N = 562$)

Table 1

Fit Statistics of the Tested LCGA Models

Classes	BIC	Adj. BIC	CAIC	Entropy	Mean Posterior Probability (SD, Range)	n of Smallest Class (%)
<i>Linear Only</i>						
1	2162.34	2146.46	2162.34	--	1.00 (--)	562 (100.0%)
2	1994.83	1969.44	1994.85	.594	.87 (.04, .84-.90)	234 (41.6%)
3	1998.27	1963.35	1998.29	.747	.86 (.03, .83-.89)	5 (8.9%)
4	2001.41	1956.97	2001.44	.801	.89 (.08, .81-1.00)	1 (1.8%)
5	2020.41	1966.44	2020.44	.828	.71 (.41, 0.00-1.00)	0 (0.0%)
<i>Linear and Quadratic</i>						
1	2168.66	2149.62	2168.67	--	1.00 (--)	562 (100.0%)
2	2007.44	1975.69	2007.46	.594	.88 (.02, .86-.89)	235 (41.8%)
3	2012.45	1968.01	2012.47	.637	.75 (.17, .55-.86)	26 (4.6%)
4	1973.47	1916.33	1973.50	.738	.87 (.08, .77-.97)	15 (2.7%)
5	1968.18	1898.34	1968.22	.786	.88 (.07, .77-.98)	5 (0.9%)

Note. BIC = Bayesian information criterion, Adj. = Adjusted, CAIC = consistent Akaike's information criterion.
Model selected as the best representation of the data in boldface for clarity.

^aThe smallest class in the model with five-class and linear effects only had 0.0% of participants, indicating an impossible solution. This information was taken into account in our model selection.

Table 2
Descriptive Statistics for Perceived Social Support and Within- and Across-Trajectory Comparisons (N = 562)

Trajectory	N (%)	T1 M (SD)	T1 vs. T2 t	T2 M (SD)	T2 vs. T3 t	T3 M (SD)
High Increasing	202 (35.9%)	2.37 (.03)	-1.02	2.40 (.03)	-9.64***	2.68 (.01)
High Increasing vs. High Decreasing (t)		6.33***		1.50		-25.61***
High Decreasing	114 (20.3%)	2.62 (.02)	3.36***	2.47 (.03)	10.27***	2.07 (.02)
High Decreasing vs. Low Stable (t)		-18.89***		-12.28***		-5.92***
Low Stable	231 (41.1%)	1.89 (.02)	-0.95	1.92 (.03)	-0.21	1.93 (.01)
Low Stable vs. Low Decreasing (t)		-0.75		-0.66		-17.06**
Low Decreasing	15 (2.7%)	1.82 (.18)	-0.19	1.85 (.16)	4.15***	.99 (.07)

Note. Within-trajectory comparisons were conducted using pair-samples *t*-tests. Across-trajectory comparisons were conducted using pairwise independent-samples *t*-tests, with Tukey adjustment for multiple comparisons. Time 1 (T1) was administered between November 2003 and August 2005 (predisaster); Time 2 (T2) was administered between May 2006 and March 2007 (postdisaster); and Time 3 (T3) was administered between March 2009 and June 2010 (postdisaster).

*
 $p < .05$,

**
 $p < .01$,

 $p < .001$

Table 3

Descriptive Data on Demographics, Hurricane Exposure, Psychological Distress and Time 3 Social Network Characteristics for Each Trajectory, and Results of Analyses Predicting Trajectory Membership (N = 562)

	<i>HI</i>		<i>HD</i>		<i>LS</i>		<i>LD</i>		<i>HI vs. LD</i>		<i>Odds Ratios (95% CI)</i>	
	<i>M (SE) / %</i>	<i>M (SE) / %</i>	<i>M (SE) / %</i>	<i>M (SE) / %</i>	<i>M (SE) / %</i>	<i>M (SE) / %</i>	<i>M (SE) / %</i>	<i>M (SE) / %</i>	<i>HI vs. LD</i>	<i>HD vs. LD</i>		
<i>Demographic Characteristics</i>												
Age	25.55 (.32)	24.78 (.38)	25.07 (.31)	25.33 (1.24)					1.01 (.90, 1.14)		.97 (.86, 1.09)	
Race												
Non-Hispanic White (reference)	11.3%	14.3%	7.2%	0.0%					--		--	
Non-Hispanic Black	82.1%	79.0%	88.8%	100.0%					--		--	
Hispanic	5.1%	3.9%	1.3%	0.0%					--		--	
Other Race/Ethnicity	1.5%	2.7%	2.6%	0.0%					--		--	
T1 Employed	46.4%	56.1%	49.0%	40.0%					1.31 (.45, 3.85)		1.92 (.64, 5.74)	
T2 Employed	56.4%	54.4%	48.5%	53.3%					1.12 (.39, 3.22)		.99 (.33, 2.97)	
T3 Employed	81.5%	81.9%	71.9%	69.3%					1.95 (.58, 6.59)		1.99 (.56, 7.13)	
Opening Doors Program	56.9%	59.6%	42.4%	60.0%					.89 (.30, 2.61)		.98 (.32, 3.00)	
<i>Disaster Exposure</i>												
Flood Depth (inches)	20.50 (1.98)	20.28 (2.68)	16.50 (1.74)	27.79 (7.43)					.99 (.97, 1.01)		.99 (.97, 1.01)	
Bereavement	28.7%	23.9%	38.2%	40.0%					.59 (.20, 1.75)		.46 (.15, 1.43)	
T3 in New Orleans	52.0%	45.2%	53.8%	58.0%					.76 (.24, 2.38)		.58 (.18, 1.87)	
<i>Psychological Distress</i>												
T1 K6	4.41 (.27)	3.31 (.30)	6.21 (.31)	7.53 (1.05)					.85 (.77, .94)**		.76 (.67, .85)***	
T2 K6	5.59 (.33)	5.23 (.35)	7.15 (.34)	11.80 (1.56)					.80 (.73, .89)***		.79 (.71, .87)***	
T3 K6	4.64 (.30)	4.70 (.39)	6.61 (.35)	8.73 (1.31)					.85 (.79, .92)***		.85 (.77, .94)**	
<i>Social Network Characteristics</i>												
Number of contacts	2.60 (.11)	2.00 (.11)	1.97 (.10)	1.07 (.30)					3.49 (1.36, 8.94)**		2.64 (1.03, 6.76)*	
Density of contacts ¹	0.84 (.02)	0.78 (.04)	0.83 (.02)	0.46 (.14)					34.12 (5.00, 243.94)***		14.73 (1.88, 115.35)*	
Few/no friends know each other ¹	17.6%	17.1%	25.5%	75.0%					.07 (.01, .72)*		.07 (.01, .72)*	
Equally close with all contacts ¹	88.5%	91.3%	80.5%	50.0%					7.69 (1.02, 57.90)*		10.49 (1.24, 88.80)*	
T1 Living with partner	14.4%	13.2%	11.5%	0.0%					--		--	

	<i>HI</i>	<i>M (SE) / %</i>	<i>HD</i>	<i>M (SE) / %</i>	<i>LS</i>	<i>M (SE) / %</i>	<i>LD</i>	Odds Ratios (95% CI)	
								<i>HI vs. LD</i>	<i>HD vs. LD</i>
T2 Living with partner	45.0%		38.9%		36.2%		26.7%	2.32 (.71, 7.51)	1.79 (.53, 6.02)
T3 Living with partner	15.4%		14.9%		13.2%		26.7%	.51 (.15, 1.67)	.48 (.14, 1.69)
Odds Ratios (95% CI)									
Demographic Characteristics									
Age	.99 (.88, 1.11)			1.02 (.98, 1.06)			.98 (.92, 1.04)		1.04 (.98, 1.10)
Race									
Non-Hispanic White (reference)	--		--	--		--	--		--
Non-Hispanic Black	--		--	.57 (.28, 1.12)			.46 (.21, 1.02)		1.25 (.60, 2.57)
Hispanic	--		--	2.46 (.54, 11.35)			1.49 (.24, 9.23)		1.65 (.41, 6.63)
Other Race/Ethnicity	--		--	.36 (.07, 1.75)			.60 (.11, 3.18)		.59 (.10, 3.61)
T1 Employed	1.43 (.49, 4.21)			.91 (.62, 1.35)			1.34 (.83, 2.14)		.68 (.42, 1.12)
T2 Employed	.81 (.28, 2.34)			1.39 (.94, 2.06)			1.22 (.76, 1.96)		1.14 (.71, 1.82)
T3 Employed	1.09 (.32, 3.69)			1.77 (1.04, 3.00)*			1.81 (.90, 3.69)		.97 (.50, 1.89)
Opening Doors Program	.49 (.17, 1.43)			1.80 (1.22, 2.67)**			2.01 (1.23, 3.29)**		.90 (.55, 1.48)
Disaster Exposure									
Flood Depth (inches)	.99 (.97, 1.01)			1.01 (1.01, 1.01)			1.01 (.99, 1.01)		1.00 (1.00, 1.00)
Bereavement	.93 (.32, 2.74)			.63 (.42, .96)*			.49 (.28, .85)*		1.28 (.74, 2.22)
T3 in New Orleans	.84 (.27, 2.60)			.92 (.61, 1.39)			.69 (.42, 1.13)		1.34 (.82, 2.18)
Psychological Distress									
T1 K6	.95 (.88, 1.03)			.90 (.84, .95)***			.79 (.73, .86)***		1.12 (1.03, 2.21)**
T2 K6	.86 (.78, .95)**			.93 (.90, .97)**			.91 (.88, .95)***		1.02 (.96, 1.08)
T3 K6	.93 (.86, 1.01)			.91 (.88, .95)***			.91 (.86, .97)**		1.00 (.94, 1.06)
Social Network Characteristics									
Number of contacts	2.56 (1.00, 6.56)*			1.36 (1.14, 1.63)***			1.02 (.84, 1.24)		1.32 (1.13, 1.55)**
Density of contacts	29.79 (3.90, 212.55)**			1.20 (.49, 2.95)			.51 (.17, 1.56)		2.32 (.84, 6.42)
Few/no friends know each other	.11 (.01, 1.13)			.63 (.35, 1.23)			.61 (.29, 1.28)		1.03 (.49, 2.17)

Odds Ratios (95% CI)				
	LS vs. LD	HI vs. LS	HD vs. LS	HI vs. HD
Equally close with all contacts	4.14 (.56, 30.54)	1.88 (.96, 3.66)	2.56 (1.00, 6.56)	.73 (.28, 1.95)
T1 Living with partner	–	1.35 (.75, 2.43)	1.22 (.59, 2.52)	1.11 (.55, 2.24)
T2 Living with partner	1.57 (.48, 5.08)	1.48 (1.00, 2.19)*	1.14 (.70, 1.86)	1.30 (.79, 2.12)
T3 Living with partner	.42 (.13, 1.43)	1.20 (.69, 2.07)	1.14 (.58, 2.22)	1.05 (.54, 2.05)

Note. HI = *High Increasing*, HD = *High Decreasing*; LS = *Low Stable*, and LD = *Low Decreasing*. Time 1 (T1) was administered between November 2003 and August 2005 (predisaster); Time 2 (T2) was administered between May 2006 and March 2007 (postdisaster); and Time 3 (T3) was administered between March 2009 and June 2010 (postdisaster). Analyses predicting trajectory membership were conducted using a three-step procedure that accounts for classification uncertainty in the LCGA model (Vermunt, 2010). For variables that were only available for participants who listed more than one contact ($n = 354$) (“Density of contacts,” “Few or no friends know each other,” “Equally close to all contacts”), this analysis was unavailable and standard multinomial logistic regression was used. Significant findings are listed in boldface for clarity.

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