



Published in final edited form as:

*Am J Community Psychol.* 2013 June ; 51(0): 544–556. doi:10.1007/s10464-013-9571-9.

## Neighborhood context and perceptions of stress over time: An ecological model of neighborhood stressors and intrapersonal and interpersonal resources

**Allison B. Brenner,**

Epidemiology, University of Michigan School of Public Health

**Marc A. Zimmerman,**

Health Behavior and Health Education, University of Michigan School of Public Health

**Jose A. Bauermeister, and**

Health Behavior and Health Education, University of Michigan School of Public Health

**Cleopatra H. Caldwell**

Health Behavior and Health Education, University of Michigan School of Public Health

---

Research on the role of residential context in adolescent development is not new (Massey & Denton, 1989; Yinger, 1995). Yet, research on neighborhood effects seems to have resurfaced with new vigor over the past five years (Diez Roux, 2003; Diez Roux & Mair, 2010). This trend may be partially attributed to an increasing domestic and international focus on health inequalities and the social determinants of health. Evidence clearly indicates an economic and racial patterning in place of residence, which may contribute to widening health inequalities (Diez Roux & Mair, 2010; LaVeist, Pollack, Thorpe, Fesahazion, & Gaskin, 2011), and individual-level models of health do not fully explain disease etiology or reasons for the large racial and ethnic health gap (Diez Roux & Mair, 2010). Contextual factors can help further understand health disparities. In this research we focus on socio-economic stressors in the neighborhood as contextual factors that may interact with individuals' intra- and interpersonal resources to influence their perceived stress trajectories from middle adolescence and early adulthood.

### Neighborhoods and stress

Black Americans, who are on average poorer and have less wealth than their White counterparts, are also more likely to live in poor and segregated neighborhoods (Massey & Denton, 1993; Merkin et al., 2009). These neighborhoods are often characterized by social disadvantage and disorder, and may lack resources necessary to counter stressors (e.g., strong social networks, economic resources) (Burgard & Lee-Rife, 2009; Latkin & Curry, 2003; Wen, Cagney, & Christakis, 2005). Structural neighborhood models clarify the association between socioeconomic indicators of the neighborhood (e.g., poverty, unemployment) and health via social, cultural, and psychological mediating processes that connect socio-economic disadvantage to health (Aneshensel, 2010; Wandersman & Nation, 1998). Although structural models generally include census-based aggregates of individual-level variables, these indicators are not simply summary measures of individual characteristics. Contextual effects are greater than the sum of their parts because they

include person-place interactions, as well as complex social interactions (Aneshensel, 2010; Yen & Kaplan, 1999).

Social neighborhood models connect the structural and economic characteristics of a neighborhood to health via social pathways, which may involve visible signs of social disorder and control in an area including deviance and crime, graffiti, noise, drug use, vandalism, litter and the presence of abandoned buildings (Aneshensel, 2010; Latkin & Curry, 2003; Ross & Mirowsky, 1999). Disordered neighborhoods may have direct and indirect effects on an individual's experience of stress (Diez Roux & Mair, 2010; Kruger, Reischl, & Gee, 2007). Disordered neighborhoods may also lack the resources necessary to buffer residents from harmful effects of disorder (Burgard & Lee-Rife, 2009; Diez Roux & Mair, 2010; Latkin & Curry, 2003).

Subjective assessments of neighborhood context are also important. They may be related to neighborhood disadvantage, moderate the relationship between disadvantage and psychological stress, or address aspects of the neighborhood that cannot be characterized by objective measures (Arnett, 2000). Residents who feel more favorably towards their neighbors and neighborhood, and who are not afraid of violence in their neighborhoods, may experience lower levels of perceived stress than residents living in highly disordered and violent neighborhoods who do not have such favorable attitudes (Diez Roux & Mair, 2010; Ross & Jang, 2000). In addition, residents who live in highly disadvantaged neighborhoods do not always perceive their neighborhood as disadvantaged, and thus perceptions of the neighborhood may better characterize residents' experiences and subsequent stress.

## Stress and Coping

Stress has been suggested as a potential cause of Black-White health inequalities, and a mechanism that may link social and economic inequalities to health (Aneshensel, Rutter & Lachenbruch, 1991; George & Lynch, 2003; Pearlin, Schieman, Fazio & Meersman, 2005). Black Americans are exposed to more hassles, chronic, acute and traumatic life stressors than Whites, and experience greater psychological stress across the life course (George & Lynch, 2003; Geronimus, Hicken, Keene, & Bound, 2006; Jackson, Knight, Carstensen & Schaie, 2006). Much of the literature on stress and health examines the relationship between exposure to stress and distress (Cutrona, Wallace, & Wesner, 2006; Elliott, 2000; Evans & English, 2002; Hammack, 2003), but few researchers consider perceived stress as an endpoint (or even test a mediating model). Understanding trends in psychological stress over time will improve our understanding of the relationships between exposure to stressors, psychological states, and physical and mental health outcomes (Schmeelk-Cone & Zimmerman, 2003).

Examining stress as an endpoint is critical in light of the non-specific, multiple pathways that link stress to physical and mental health (Aneshensel et al., 1991). Additionally, some of the null and inconsistent findings for the relationship between neighborhood disadvantage and health may be due to the long lag time between exposure to stressors and the manifestation of health outcomes, as well as a lack of sufficient longitudinal data on lifetime stressor exposure and health (Ellen, Mijanovich, & Dillman, 2001). Using perceived stress as an intermediary endpoint enables researchers to examine more immediate relationships between stressor exposure and health. Although a measure of perceived stress is likely to reflect current feelings of stress instead of cumulative life stress, it avoids confounding of stressor exposure and stress. Many researchers include life event scales, or checklists of acute stressors as their measure of stress, but this fails to differentiate the exposure (e.g., death of a loved one) from the psychological reaction to the exposure (e.g., feeling out of control in one's life), which may contribute to the mixed results in the literature (Stancil,

Hertz-Picciotto, Schramm, & Watt-Morse, 2000). Although it seems reasonable that an individual who lost a loved one would experience psychological stress due to the stressor, exposure to a stressor does not necessarily lead to stress. The experience of stress is mediated or moderated by interpersonal (e.g., social support) and intrapersonal (e.g., high effort coping) resources, as well as shaped by social, economic and structural context (Pearlin, 1989).

## Conceptual Framework

The Transactional Model of Stress and Coping describes the process by which stressors affect psychological stress outcomes, social resources and coping. Residents living in highly stressful, disadvantaged neighborhoods may have less access to coping resources such as tangible (e.g., economic resources), intrapersonal (e.g., self-efficacy) and interpersonal resources (e.g., support system) (Myers, 2009). Neighborhood stressors like socio-economic disadvantage are likely appraised as highly uncontrollable and personally relevant, as they are institutionalized in American society and reinforced daily, and thus shape the lives of people living in highly segregated, urban areas (Massey & Denton, 1993). It is likely, therefore, that individuals will evaluate stressors as uncontrollable and may rely on avoidant coping strategies like substance use, which may actually increase psychological distress (Jackson, et al., 2006; Wenzel, Glanz, & Lerman, 2002). Jackson et al. (2009) hypothesize that when people are confronted with chronic and uncontrollable stressors they may engage in unhealthy behaviors like substance use to achieve an immediate relief of the psychological strain.

Residents of disadvantaged neighborhoods may also engage in active coping strategies to alleviate stress. The role of social support as a means to alleviate and control stress is widely documented in the literature (Ensel & Lin, 1991; Thoits, 1995). Social support from family and friends may diminish the detrimental effects of living in a highly disadvantaged neighborhood, as suggested by the literature and models of stress and coping (Lazarus & Folkman, 1984; Thoits, 1995). Another active coping strategy has been identified as John Henryism (James 1994). James (1994) presents John Henryism as a metaphor for high effort coping, which is a prolonged coping process in response to extreme psychosocial environmental stressors and barriers to success (James, 1994; Sellers & Neighbors, 2008). The John Henryism hypothesis suggests that Black Americans are exposed to chronic stressors (i.e. financial strain, racism), which require excessive extents of coping to endure. Extended coping is hypothesized to slowly break down the body, both mentally and physically (James, 1994; McEwen & Seeman, 1999; Segerstrom & Miller, 2004). High effort coping may decrease perceptions of stress, but may also result in physical wear on the body.

The socio-ecological framework elucidates how interactions across multiple contexts may affect an individual's perception of stress. We examine the ways in which neighborhood stressors may interact with an individual's intra- and interpersonal resources as a part of the stress and coping process, to affect their perceived stress over time. The socio-ecological framework includes intrapersonal, interpersonal, organizational, community and environmental/policy levels of influence, and describes how these levels interact to affect health (Glanz, Rimer, & Lewis, 2002). Although many researchers studying neighborhood effects on health include individual-level control factors, few actually test interactions between contextual and individual-level factors (Latkin, German, Hua & Curry, 2009). We use an ecological framework to examine the ways in which individual-level intra- and interpersonal factors are shaped by the larger neighborhood environment to affect individuals' psychological stress. We first consider the direct effect of neighborhood disadvantage on an individual's perceived stress trajectory during middle adolescence and

early adulthood. We also consider mediating and moderating pathways between neighborhood disadvantage and stress through intra- and interpersonal risk and promotive factors including social support, high effort coping, substance use, and neighborhood perceptions, as these factors may interact with neighborhood disadvantage to influence an individual's perception of stress.

## Methods

### Design and Sample

Data from the Flint Adolescent Study (FAS), a longitudinal study of 850 youth at risk for substance use and school dropout were used for this study (Schmeelk-Cone & Zimmerman, 2003; Xue, Zimmerman, & Caldwell, 2007). Eligible students included ninth graders enrolled in one of four public high schools in Flint, Michigan, who had an 8th grade grade point average (GPA) of 3.0 or below upon entering high school. Youth who were diagnosed by the schools with emotional or developmental impairments were excluded from the study. Youth self-identified as African American (80%), White (17%) or Bi-racial (3%). Males and females were equally represented in the sample.

The FAS consists of four waves of data collected during the high school years (Waves 1–4; 1994–1997) and four waves of data after high school (Waves 5–8; 1999–2002). Retention rates were generally high (90% from Waves 1 to 4 and 75% from Waves 4 to 8). Data were collected during structured face-to-face interviews conducted either at school or at alternative community locations (University of Michigan Institutional Review Board approval, UMIRB# H03-0001309). Before each interview, the participant read and signed the study's consent forms and had an opportunity to ask questions regarding the confidentiality procedures. On average, each interview lasted 50–60 min. A self-administered questionnaire assessed more sensitive information (e.g. substance use, sexual risk behavior) and was distributed at the conclusion of each interview to facilitate confidentiality. The individual-level data collected in Waves 1 through 4 (1994–1997) were linked to 1990 census data based on geo-coded home address information, and data from Waves 5 through 8 (2000–2003) were linked to 2000 census data.

The current study uses data from Waves 2 through 8 of the study. We exclude the first year of data collection because the dependent variable examined in this paper was not included in the first wave. The analysis focuses on a sub-sample of 665 African American youth ( $M_{age}=15.9$  year at Wave 2,  $M_{age}=23$  years at Wave 8, 51% female) who had at least one wave of non-missing data for the dependent variable, as well as corresponding census block group data (see Table 1 for descriptive statistics for the sample).

### Measures

**Perceived stress**—Perceived (or psychological) stress was assessed using 11 items from the Cohen and colleagues' Perceived Stress Scale (PSS) (Cohen et al., 1983). The original 14-item scale designed to measure subjective (psychological) stress was shortened based on item analysis to increase parsimony in the FAS questionnaire, and the shortened measures had similar psychometric properties to the original scale. Bivariate correlations between the 11-item scale and key study variables were similar to those of the full scale. The items were averaged and used as a continuous measure ranging from 1=*low* to 5=*high* perceived stress ( $\alpha = 0.71$  to 0.83).

**Demographic factors**—Family socioeconomic status (SES) was measured using codes developed by the National Opinion Research Center and then standardized to facilitate interpretation (Nakao & Treas, 1990). The score was assigned based on 20 occupational

classifications, ranging from private household work (scored as 29.28) to professional (scored 64.38). Scores were based on the highest occupational prestige score for either parent. The mean prestige score in our sample is 39.82 ( $SD=9.80$ ) which corresponds to a blue-collar occupation (Nakao & Treas, 1990). Mother's highest education level was assessed using a seven-point scale (1=*grade school or less* to 7=*graduate/professional school*). The mean education level in our sample was 4.40 ( $SD=1.88$ ), which corresponds to a vocational/training school education. Respondent *sex* (male=1, female=0) was also assessed.

**Substance Use**—Substance use is a composite measure that includes items about smoking (number of cigarettes smoked in the past 30 days), alcohol use (composite measure of past 30 day alcohol use, binge drinking over the past two weeks and drinking to get high), and marijuana use (past 30 day marijuana use). Each item or scale was standardized, and the average of the three standardized variables was computed to create a substance use scale ( $\alpha = 0.62$  to 0.81). Higher values denote more substance use.

**High effort coping**—High effort coping (or John Henryism) was measured using eight-items from James' original 12-item John Henryism scale (James, 1994). We dropped four of the items due to limited variance, to reduce the length of the measure included in the questionnaire. The 12-item version retained similar psychometric properties as the full John Henryism scale. The high effort coping measure asks respondents to rate items like: "Hard work is the best possible way for someone to get ahead in life," and "sometimes I feel that if anything is going to be done right, I have to do it myself" (James, 1994). These items are rated on a 5-point Likert scale (1=*not true* to 5=*very true*) and then averaged to create a measure of high effort coping ranging from 1=*low coping* to 5=*high coping* ( $\alpha = 0.70$  to .84 across waves).

**Social Support**—Three sources of perceived social support were assessed using a shortened version of Procidano and Heller's perceived support scales (Procidano & Heller, 1983). The scales were shortened in order to increase parsimony in the questionnaire, and the adapted measures retained similar psychometric properties as the original versions. Mother's support was measured by five items from the parental support scale, which were modified to indicate "mother" instead of "parents" more generally, and responses used a 5-point Likert Scale. Items include the degree to which the adolescent's mother gives emotional and instrumental support, and the closeness of the mother-child relationship. The support scale ranges from 1=*low* to 5=*high* ( $\alpha = 0.88$  to 0.93). Peer support was also included in Waves 2–8, and the measure includes items assessing emotional and instrumental support, which are averaged to create a composite measure. Like the measure of mother support, the scale ranges from 1 to 5 ( $\alpha = 0.87$  to 0.94). Finally, the questionnaire asked the respondent to identify a *person in their lives to whom they feel closest*. This person is likely to be a significant other, but could be another family member or friend. These items were added to the questionnaire in Wave 5 and were thus assessed only in Waves 5–8. Relationship support was measured as a mean score of 6–8 items (this scale was changed slightly between waves of the study) and included items such as: "how much the person provides you reassurance and encouragement when needed", "shows that he/she cares about you as a person", and "gives you useful information or advice when you need it." The support scale ranges from 1=*low* to 5=*high* ( $\alpha = 0.82$  to 0.86).

**Neighborhood perceptions**—Three measures of perceptions of the neighborhood were included in this analysis. The first measure, neighborhood attitudes, assesses the way people feel about their neighborhood. Sample items include: "I like living in my neighborhood", "If I needed advise about something, I could go to someone in my neighborhood", and "I

believe my neighbors would help me in an emergency.” Each of the five items was assessed using a Likert Scale (1=*strongly disagree* to 4=*strongly agree*). An average of the five items was computed and the scale ranges from 0=*unfavorable* to 3=*very favorable* neighborhood attitudes ( $\alpha = 0.72$  to  $0.76$ ). The second neighborhood perception measure asks respondents to rate their fear of the level of violence in the neighborhood (1=*no fear* to 4=*high fear*). A dichotomous indicator of neighborhood fear was created because of a highly skewed distribution towards reporting no fear. This indicator was based on the distribution around the mean of fear, where 0=*low* (below the mean) and 1=*high* (above the mean). Finally, participants reported on the degree to which they worried that someone in their neighborhood would physically hurt them. This item was initially assessed on the same four-point scale as the neighborhood fear item, and a dichotomous indicator of worry was similarly created to reduce skewness (0=*low worry*, 1=*high worry*).

**Neighborhood disadvantage**—The neighborhood level disadvantage variables were created from 2000 census data, as this census year is closer to the majority of FAS waves (1995, 1996, 1997, 1999, 2000, 2001, 2002) than the 1990 census data. Although there were some changes in levels of block group disadvantage between the 1990 and 2000 Census, we conducted a sensitivity analysis to determine how many census block groups experienced a significant change in socio-economic disadvantage. Only about 5% of the block groups experienced changes in disadvantage between the two census years that were greater than 1.5 standard deviations in either direction. Due to this relatively small change, we use the 2000 census data in this analysis, which were linked to the individual data by geocoding techniques.

Neighborhood was conceptualized at the census block group-level ( $N=162$ ) for this analysis, as the block group is small enough that it contains limited variation in important census indicators of socio-economic disadvantage, but allows for examination of variation across neighborhoods. Four census items were used to create a composite neighborhood socioeconomic disadvantage measure: percent of families in the census block group at or below 1.5 times the Federal Poverty Level (FPL), percent of female single-headed households in the block group below the FPL with at least one child under 18 years of age, percent of unemployment in the block group and percent of households with a head of household who has less than a high school education level ( $\alpha = 0.83$ ). Standardized values of each item were computed and summed to create the measure of neighborhood disadvantage. In addition to the composite measure, individual disadvantage items were also tested in the analysis. Higher values denote greater levels of neighborhood disadvantage in the census block group.

### Analytic strategy

To account for both the longitudinal and nested structure of the data we employed a three-level analysis using Hierarchical Linear and Nonlinear Modeling software (HLM 6) (Li et al., 2006). We examined changes in an individual’s perceived stress over time as a function of individual and neighborhood characteristics (e.g., social support, substance use, neighborhood disadvantage). We first examined a null growth model, which contained a term for the average initial perceived stress (intercept) and the growth parameters (linear and curvilinear change in stress over time). We used this model to determine whether individuals’ perceived stress varies over time, and the shape of the trajectory by which it varies. The change in perceived stress between baseline (beginning of high school) and early adulthood (three to four years post high school) was modeled using linear and quadratic growth parameters. The dependent variable is interpreted as the change in perceived stress for each additional year after baseline.

We then examined whether the between-neighborhood differences were a function of neighborhood-level disadvantage. The neighborhood disadvantage measure was added to the level-3 intercept and growth parameter equations, and the error term was allowed to vary at random, addressing the hypothesis that the initial perceived stress level (intercept) and changes in perceived stress over time (slope and acceleration) are neighborhood-specific. The model indicates that an individual's perceived stress level is a function of the average perceived stress level across all neighborhoods, the contribution of the neighborhood's specific disadvantage level on the overall perceived stress level, a person's linear change in perceived stress over time, the overall effect of a specific level of disadvantage on a person's linear change in stress, the curvilinear change in stress, the unique effect of a particular neighborhood on an individual's intercept and slope for perceived stress, and the residuals.

Next, individual-level controls were added to the model at level-2 to determine whether the relationship between neighborhood disadvantage and perceived stress remained significant after controlling for an individual's SES, sex and mother's education. The level-2 equation models the baseline perceived stress level and the growth parameters as a function of the static individual-level factors. Finally, to examine the relationship between exposure to neighborhood disadvantage and perceived stress over time, while considering intra- and interpersonal factors, we examined a full three-level model. This model also tests whether exposure to neighborhood disadvantage affects the stress trajectory above and beyond the effect of individual-level factors.

### Missing data

Although it is not necessary for participants to have complete data for the time varying covariates, HLM cannot handle missing data at the individual (level-2) or neighborhood (level-3) levels. Participants who did not have data at the census block group level were excluded from this analysis (N=15). The excluded cases did not differ from included cases on any of the time-varying predictors or the demographic variables. We employed the expectation maximization (EM) algorithm to impute missing data at level-2 for family SES and mother's education (West et al., 2006) and conducted an attrition analysis comparing participants with missing (N=88) and complete data (N=593). All missing data are assumed to be missing at random.

## Results

### Change in perceived stress over time

At baseline, the average perceived stress for an individual was moderate ( $\beta=1.65$ , [ $SE=0.03$ ],  $p<0.01$ ), and decreased linearly (Table 2). The linear model of change in perceived stress was tested against a quadratic model and the results of the model comparison indicated that the stress trajectory was, in fact, quadratic ( $\chi^2=10.00[1]$ ,  $p<0.01$ ). The quadratic component of time can be considered as the curvilinear change, or acceleration in an individual's stress trajectory. On average in our sample, perceived stress increased quadratically over time ( $\beta=0.004$ , [ $SE=0.00$ ],  $p<0.01$ ). Although the absolute difference in the minimum and maximum stress level between baseline and Wave 8 was not large (~0.15), the change in stress over time was significant in both linear and curvilinear growth parameters.

### Change in perceived stress and neighborhood stressors

The addition of neighborhood socioeconomic disadvantage improved the model fit ( $\chi^2=8.44[2]$ ,  $p<0.05$ ) over the null model previously presented. Living in a more disadvantaged neighborhood increased an individual's initial perceived stress levels, and individuals living in more disadvantaged neighborhoods reported a steeper decrease in perceived stress (slope)

over time than individuals in less disadvantaged neighborhoods (Table 2, Model 1; Figure 1). This pattern, however, was reversed approximately four years after baseline (~age 20) when individuals who live in neighborhoods with the lowest levels of disadvantage experienced steeper increases in perceived stress than individuals who lived in the most disadvantaged neighborhoods. Neighborhood disadvantage did not explain any of the variance in the quadratic growth term and was therefore dropped from this equation.

Adding the demographic variables improved the fit of the model and these variables are retained in further analysis ( $\chi^2=36.02[2]$ ,  $p<0.01$ ). Individuals who had higher family SES at baseline reported lower perceived stress levels at baseline, and men reported lower initial perceived stress levels than their female counterparts. Non-significant demographic predictors were dropped in subsequent models.

### Effect of time-varying covariates on perceived stress over time

Next, the time-varying covariates were entered into the model as blocks of theoretically meaningful constructs (Table 2, Models 2–4). All of the level-1 terms remained uncentered, as zero has a meaningful value for each variable.

**Risk model**—First, substance use was added to the model containing neighborhood disadvantage and individual controls (SES and sex) to examine the hypothesis that using substances may alter a 2 person’s perceptions of stress. Inclusion of substance use improved the model fit ( $\chi =89.22[1]$ ,  $p<0.001$ ). Individuals who used more substances reported more perceived stress over time than individuals who used fewer substances.

**Protective model**—Three promotive factors were added to the risk model to determine whether they moderate the effects of stressors on perceived stress (Model 3). Friend support was not significant and was dropped from the model. Mother and relationship support were inversely associated with an individual’s perceived stress over time. High effort coping was also inversely associated with perceived stress over time, such that individuals, who reported higher levels of John Henryism, had lower levels of perceived stress over time. Addition of the promotive factors to the model reduced the effect of neighborhood disadvantage on perceived stress to non-significance. Inclusion of the promotive factors also eliminated the associations between linear and quadratic growth and stress. The variance term indicates that all of the between-neighborhood variation in the linear change in perceived stress is accounted for by the level-1 and level-2 factors included in the model ( $var(\pi_{10})=0.00$ ,  $\chi^2 =140.38(146)$ ,  $p<0.5$ ).

**Full model**—Three neighborhood perception variables were added to the risk and promotive model, although only two were retained (Model 4). The indicator of an individual’s fear of violence in their neighborhood was not significant and was dropped from the final model. People who reported more favorable attitudes toward their neighborhood also reported less perceived stress over time and those who were worried about being physically hurt in their neighborhood reported more stress over time than individuals who felt safe. Addition of the two neighborhood perception measures improved the overall fit of the model ( $\chi^2 =79.32(2)$ ,  $p<0.01$ ) and the other predictors remained unchanged from the previous model.

### Neighborhood variation in time-varying covariates

Neighborhood disadvantage was not associated with any of the slopes of the time varying covariates at level-3. The relationship between high effort coping and perceived stress over time varied based on census block group-level differences. Despite significant random

variation in the slope of high effort coping, this variation was not explained by neighborhood disadvantage.

## Discussion

We found that while neighborhood disadvantage was associated with the stress trajectory during adolescence and early adulthood, this relationship became non-significant when individual risk and promotive factors were included in the model. This may indicate that proximal influences on adolescents and young adults have a stronger effect than more distal neighborhood factors, as set forth in theories of stress and coping, which identify intra- and interpersonal factors as important intermediaries in the stress process. Our results may also suggest that contextual factors other than socio-economic disadvantage are important. Factors like social disorder and decay included in neighborhood social models may exert more immediate influences on residents than Census indicators of disadvantage, and future research could address this limitation.

Our risk model indicates that individuals who used more substances reported more perceived stress over time than youth who used fewer substances. These results are consistent with theories of stress and coping, suggesting that alcohol and drugs may be used to reduce the immediate strain of stressor exposure and alleviate stress, as hypothesized by Jackson and colleagues (Jackson, Knight, & Rafferty, 2009). The directionality of this relationship is not clear; individuals who experience more psychological stress may use substances to relieve stress, or individuals who use substances may feel more stressed due to the effects of substance use (Jackson et al., 2006; Jackson, Treiber, Turner, Davis, & Strong, 2004). Regardless of directionality, substance-using individuals may be at greater risk for experiencing higher levels of psychological stress and resulting health problems related to stress. These results suggest that residents of disadvantaged neighborhoods, who experience more chronic stressors than residents of less disadvantaged neighborhoods, are more likely to use substances as a means of relieving stress and tension, but that increased use of substances also contributes to increasing psychological stress over time.

Social support from a mother and another important relationship was associated with less perceived stress over time as expected based on models of stress and coping. Although researchers have consistently found social support beneficial in reducing stress during adolescence and adulthood (Cohen, 1988; Turner & Turner, 2005; Weigel, Devereux, Leigh, & Ballard-Reisch, 1998), results for the effect of social support as a buffer against neighborhood stressors on health and well-being have been mixed (D'Imperio, Dubow, & Ippolito, 2000; M. Elliott, 2000; Gonzales, 2001; Landis, 2007; Stockdale et al., 2007; M. Zimmerman & Brenner, 2009). Additionally, several researchers have found that social support is an effective stress buffer for individuals living in more advantaged neighborhoods, but not in neighborhoods with higher levels of socioeconomic disadvantage or under the most stressful conditions (Aneshensel 2010; D'Imperio, et al., 2000; Elliott, 2000).

Our results, however, indicate that social support is a vital resource for youth regardless of their neighborhood context. Individuals who reported receiving more social support were not as strongly affected by neighborhood disadvantage. These results support the Transactional Model of Stress and Coping, which emphasizes the beneficial effects of social support as a coping resource to buffer the harmful effects of stressor exposure. This finding is not consistent with previous research indicating differential effects of social support on health based on the degree of neighborhood disadvantage (Elliott, 2000). Elliott (2000) found that in high SES neighborhoods, social support was associated with physical and mental health, but had no effect in the most disadvantaged neighborhoods. One explanation

for this inconsistency in findings is that the participants in our sample may have demonstrated notable resilience to adversity, despite living in disadvantaged neighborhoods. Another explanation might be that while the neighborhoods included in our analysis are relatively disadvantaged, the range of disadvantage may be greater than in the study by Elliott (2000). Our results, however, suggest that models of neighborhood effects may be most effective if they include both individual and social factors.

As hypothesized, individuals in our sample who reported more high effort coping also reported less perceived stress over time. Coping is likely to alleviate the effects of stressor exposure and help individuals avoid psychological stress (Pearlin & Schooler, 1978; Thoits, 1995). Active coping, however, may be most effective in alleviating the effects of stressor exposure in situations in which individuals perceive greater control over the stressor (Compas, Banez, Malcarne & Worsham, 1991). Therefore, one would expect active coping to be less effective in the face of exposure to disadvantaged neighborhoods, but our results suggest high effort coping was beneficial in reducing stress. One explanation may be that our measure assessed beliefs about one's control in their personal lives, while the effects of neighborhood disadvantage may be viewed as something that is less relevant for personal control. Another explanation may be that neighborhood disadvantage is not *perceived* as stressful by our respondents because they perceive this context as the norm. Future research that examines perceived coping related to neighborhood stress may help elucidate our understanding of how the various ecological levels may interact to affect perceived stress in individuals.

These interpretations are consistent with our finding that an individual's perception of their neighborhood predicted psychological stress regardless of their neighborhood's economic disadvantage. Residents who had more favorable attitudes towards their neighborhood experienced less stress over time. Conversely, residents who worried more about getting hurt in their neighborhood reported more stress. These results support neighborhood models, which connect structural neighborhood disadvantage to health through psychological and stress pathways (Aneshensel, 2008). Yet, it is also possible that measures at the same level of analysis are more likely to be correlated than measures across levels. This poses a difficult problem for researchers to develop measures across levels that do not make judgments about experiences of stress or the effects of stressors. Our results, however, support Aneshensel's suggestion that researchers studying neighborhood effects might be cautioned against ignoring individual perceptions in their models.

An interesting relationship emerged around age 19, when participants were transitioning into adulthood. Individuals who lived in neighborhoods with the highest levels of socioeconomic disadvantage experienced continuing declines in perceived stress between age 19 and 22, while young adults living in neighborhoods with the lowest degree of disadvantage experienced slight increases in perceived stress during the same time period. Although these trends seem counterintuitive, one possible explanation may be that the young adults who live in neighborhoods with the highest levels of disadvantage eventually begin to succumb to the effects of socioeconomic disadvantage; this may leave them emotionally numb to their environment, and they may become less reactive to exposure to chronic stressors. Some researchers, for instance, theorize that people may reach a state of emotional equilibrium, in which the effects of persistent poverty subside after the initial stressful effects have passed (Elder & Caspi, 1988). Another explanation may be that researchers overestimate the effects of neighborhoods on adolescents. Adolescents may focus on more self- and peer-centered issues, while their perceptions of their neighborhoods are less relevant to them.

Our measurement of neighborhood context, however, may be somewhat limited, as neighborhood disadvantage was based only on census indicators of social and economic

disadvantage. Although our measure is consistent with that used by past researchers, it may not fully capture all of the important aspects of the neighborhood social environment that relate to stressor exposure, especially during adolescence and young adulthood. Neighborhood disadvantage, for example, may not account for exposure to crime, violence, or substance use in the neighborhood especially relating to gang activity, which may be particularly relevant for adolescents and young adults. Census-based measures of disadvantage may also fail to account for important social processes like social capital and collective efficacy, as well as influences of the built environment, access to resources, and environmental exposures, which are all related to health, behavior and well-being (Diez Roux & Mair, 2010; Elliott, 1996; Sampson, Raudenbush, & Earls, 1997). Including more diverse and comprehensive measures of neighborhood context would help provide a more detailed analysis of neighborhood effects.

It is also possible that, although most researchers treat neighborhood disadvantage as a static construct, some neighborhoods may improve or decline over time. Similarly, the amount of time individuals spend in a particular neighborhood context may also vary, as family mobility may affect the type of neighborhoods youth experience (Wodtke, Harding, & Elwert, 2011). Wodtke et al. (2011) propose that weak or null neighborhood effects may be a result of limitations in the measurement of neighborhood disadvantage. They suggest that a current measure of disadvantage may conflate this immediate exposure with lifetime exposure, greatly diluting the results (Wodtke, et al., 2011). A related issue in developing a measure of neighborhood disadvantage is determining the most pertinent census year. For studies involving youth, earlier life years may be the most relevant neighborhood context to examine, and not the one concurrent with their age at the time of data collection. Wodtke et al. (2011) found, for instance, that sustained effects of exposure to neighborhood disadvantage measured over 17 years on high school graduation were much greater than previously estimated cross-sectional effects. Their research accounted for early exposure, cumulative exposure, and selection into neighborhoods (Wodtke, et al., 2011). Nevertheless, the results from our sensitivity analysis suggest that in our sample neighborhood changes did not pose a significant problem. While our participants frequently change residence, they typically move into new neighborhoods with similar levels of disadvantage. In fact, we found that less than four percent of participants moved into neighborhoods with more than a 1.5 standard deviation change in disadvantage, in either direction, and these changes did not predict outcomes.

Despite these limitations, this study adds unique information to the empirical literature. First, we examined changes in perceived stress over seven years, which included two important developmental periods: adolescence and the transition into adulthood. Growth curve modeling allowed us to determine the shape of the perceived stress trajectory in our sample. This approach addresses developmental issues and supports research that indicates that stress, coping and mental health vary by age (Compas, Connor-Smith, Saltzman, Thomsen & Wadsworth, 2001; Wheaton & Clarke, 2003). Examining perceived stress over time also enabled us to identify the relationship between disadvantage and stress during the critical developmental period of late adolescence and emerging adulthood. Our results suggest that intervening around ages 15–17 and during the transition into adulthood may be most effective, as this was when stress was greatest. While only a small amount of the variation in perceived stress in our sample was explained by neighborhood disadvantage, which resulted in a small absolute difference in perceived stress at each wave based on the degree of disadvantage, these differences were statistically significant and theoretically consistent. Effects for neighborhood exposure are typically much smaller than those associated with individual-level exposures (Duncan & Raudenbush, 1999). Despite being quantitatively small, they may have significant implications, and their effects may accumulate over time (Prentice & Miller, 1992). Duncan and Raudenbush (1999) discuss

small effect sizes in research on context and health and note that “it is important to realize that effects may turn out to be small because the degree of natural variation is small, rather than because the setting is irrelevant” (p. 29). Additionally, McClelland and Judd (1993), note that evidence of any interaction effects in observational research that includes multiple covariates is notable. Thus, our small effect for the association between neighborhood disadvantage and perceived stress over time may be quite meaningful in practice (Hurd, Zimmerman, & Xue, 2009).

Second, our use of multi-level modeling enabled us to account for the variation in perceived stress at the intra-individual, individual and neighborhood level. This correctly partitions the variance in stress into each level of influence, resulting in more unbiased and accurate variance and covariance estimates. In addition, this approach allowed us to test cross-level interactions and their effect on the stress trajectory.

Finally, our sample included relatively high risk, African American youth. Although stress is a universal construct, it is not equally distributed in the population (Turner & Turner, 2005), and thus examining neighborhood stressors and perceived stress in a more disadvantaged, African American population is vital for to avoid conflating SES and race in studies that include more diverse samples. This study suggests that a continued focus on neighborhood as a source of stressor exposure for adolescents and young adults is warranted. It may be that neighborhood influences are not as important as individual and interpersonal influences in predicting perceived stress, or that neighborhood socioeconomic disadvantage is not the best measure of neighborhood stressor exposure especially for adolescent and young adult population.

This study adds to the growing literature on neighborhood effects on adolescent development, and suggests that more research is necessary. Our finding that neighborhood effects were washed out after more proximal factors were considered suggests that future research might examine neighborhood factors such as segregation, crime, collective efficacy, neighborhood social capital, and access to resources rather than more global measures of disadvantage. Nevertheless, the fact that neighborhood disadvantage did predict psychological stress when promotive factors were not in the model also suggests that it is too early to abandon efforts to understand how neighborhood context may influence adolescent and young adult development.

## Acknowledgments

This research was funded by the National Institute on Drug Abuse, Grant DA07484

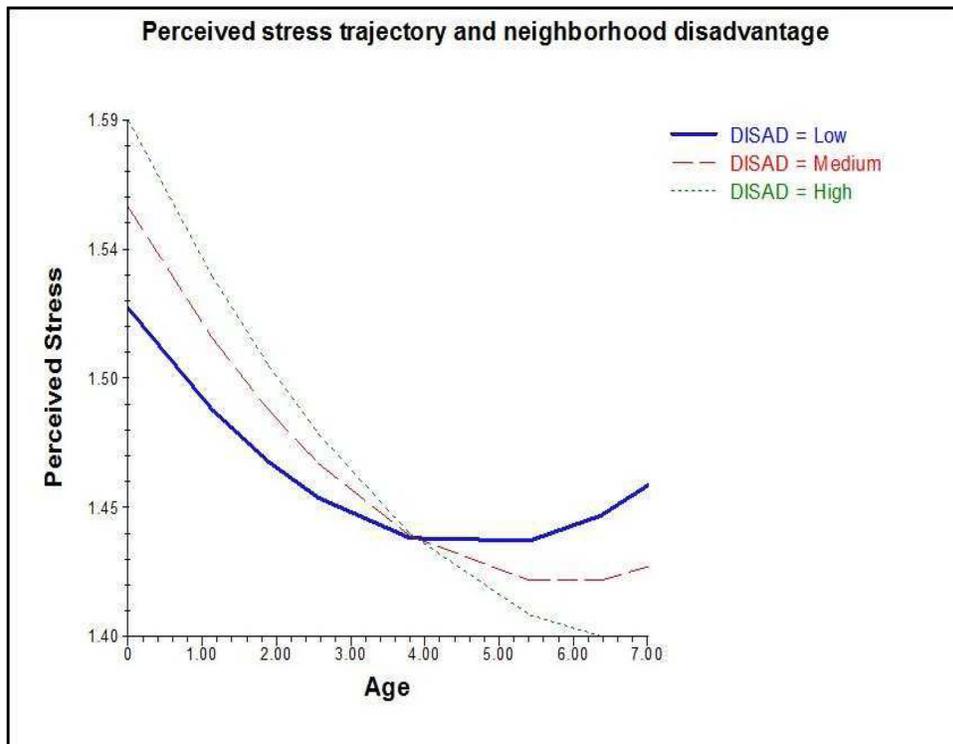
## References

- Aneshensel, C. Neighborhood as a social context of the stress process. Los Angeles: California Center for Population Research, University of California; 2008. p. 1-36.
- Aneshensel C, Rutter C, Lachenbruch P. Social structure, stress, and mental health: Competing conceptual and analytic models. *American Sociological Review*. 1991; 56(2):166–178.
- Aneshensel, CS. Neighborhood as a social context of the stress process. In: Avison, WR.; Aneshensel, CS.; Schieman, S.; Wheaton, B., editors. *Advances in the Conceptualization of the Stress Process: Essays in Honor of Leonard I Pearlman*. New York City: Springer; 2010. p. 35-52.
- Arnett JJ. Emerging adulthood: A theory of development from the late teens through the twenties. *American Psychologist*. 2000; 55(5):469–480. [PubMed: 10842426]
- Burgard S, Lee-Rife S. Community characteristics, sexual initiation, and condom use among young Black South Africans. *Journal of Health and Social Behavior*. 2009; 50:293–309. [PubMed: 19711807]

- Cohen J, Kamark T, Mermelstein R. A global measure of perceived stress. *Journal of Health and Social Behavior*. 1983; 24:385–396. [PubMed: 6668417]
- Cohen S. Psychosocial models of the role of social support in the etiology of physical disease. *Health Psychology*. 1988; 7(3):269–297. [PubMed: 3289916]
- Compas B, Banez G, Malcarne V, Worsham N. Perceived control and coping with stress: A developmental perspective. *Journal of Social Issues*. 1991; 47(4):23–34.
- Compas BE, Connor-Smith JK, Saltzman H, Thomsen AH, Wadsworth ME. Coping with stress during childhood and adolescence: Problems, progress, and potential in theory and research. *Psychological Bulletin*. 2001; 127(1):87–127. [PubMed: 11271757]
- Cutrona C, Wallace G, Wesner K. Neighborhood characteristics and depression: An examination of the stress process. *Current directions in psychological science*. 2006; 15(4):188–192. [PubMed: 18185846]
- D’Imperio R, Dubow E, Ippolito M. Resilient and stress-affected adolescents in an urban setting. *Journal of clinical child psychology*. 2000; 29(1):129–142. [PubMed: 10693039]
- Diez Roux AV. Residential environments and cardiovascular risk. *Journal of Urban Health*. 2003; 80(4):569–589. [PubMed: 14709706]
- Diez Roux AV, Mair C. Neighborhoods and health. *Annals New York Academy of Sciences*. 2010; 1186:125–145.
- Duncan GJ, Raudenbush S. Assessing the effects of context in studies of child and youth development. *Educational Psychologist*. 1999; 34:29.
- Elder GH, Caspi A. Economic Stress in Lives: Developmental Perspectives. *Journal of Social Issues*. 1988; 44(4):25–45.10.1111/j.1540-4560.1988.tb02090.x
- Ellen I, Mijanovich T, Dillman KN. Neighborhood effects on health: Exploring the links and assessing the evidence. *Journal of Urban Affairs*. 2001; 23(3&4):391–408.
- Elliott D, Wilson W, Huizinga D, Sampson R, Elliott A, Rankin B. The effects of neighborhood disadvantage on adolescent development. *Journal of Research in Crime and Delinquency*. 1996; 33:389.
- Elliott M. The stress process in neighborhood context. *Health & Place*. 2000; 6(4):287–299. [PubMed: 11027954]
- Ensel WM, Lin N. The life stress paradigm and psychological distress. *Journal of Health and Social Behavior*. 1991; 32(4):321–341. [PubMed: 1765624]
- Evans G, English K. The environment of poverty: Multiple stressor exposure, psychophysiological stress, and socioemotional adjustment. *Child Development*. 2002; 73(4):1238–1248. [PubMed: 12146745]
- George LK, Lynch SM. Race differences in depressive symptoms: A dynamic perspective on stress exposure and vulnerability. *Journal of Health and Social Behavior*. 2003; 44(3, Special Issue: Race, Ethnicity, and Mental Health):353–369. [PubMed: 14582313]
- Geronimus AT, Hicken M, Keene D, Bound J. “Weathering” and age patterns of allostatic load scores among Blacks and Whites in the United States. *American Journal of Public Health*. 2006; 96(5): 826–833. [PubMed: 16380565]
- Glanz, K.; Rimer, B.; Lewis, F., editors. *Health Behavior and Health Education: Theory, Research and Practice*. 3. San Francisco: John Wiley and Sons, Inc; 2002.
- Gonzales. On the limits of coping: Interaction between stress and coping for inner-city adolescents. *Journal of Adolescent Research*. 2001; 16(4):372–395.
- Hammack PL. Toward a Unified Theory of Depression Among Urban African American Youth: Integrating Socioecologic, Cognitive, Family Stress, and Biopsychosocial Perspectives. *The Journal of Black Psychology*. 2003; 29(2)
- Hurd NM, Zimmerman MA, Xue Y. Negative adult influences and the protective effects of role models: A study with urban adolescents. *Journal of Youth and Adolescence*. 2009; 38(6):777–789. [PubMed: 19636780]
- Jackson, JS.; Knight, KM.; Carstensen, LL.; Schaie, KW. Race and self-regulatory health behaviors: The role of the stress response and the HPA axis in physical and mental health disparities. In: , editor. *Social structure, aging and self-regulation in the elderly*. New York: Springer; 2006.

- Jackson JS, Knight KM, Rafferty JA. Race and unhealthy behaviors: Chronic stress, the HPA axis, and physical and mental health disparities over the life course. *American Journal of Public Health*. 2009; 99(12):1–7.
- James S. John Henryism and the health of African Americans. *Culture of Medicine and Psychiatry*. 1994; 18:163–182.
- Kruger D, Reischl T, Gee G. Neighborhood social conditions mediate the association between physical deterioration and mental health. *American Journal of Community Psychology*. 2007; 40:261–271. [PubMed: 17924185]
- Landis D. Urban adolescent stress and hopelessness. *Journal of Adolescence*. 2007; 30(6):1051–1070. [PubMed: 17467052]
- Latkin C, Curry A. Stressful neighborhoods and depression: A prospective study of the impact of neighborhood disorder. *Journal of Health and Social Behavior*. 2003; 44(1):34–44. [PubMed: 12751309]
- Latkin CA, German D, Hua W, Curry A. Individual-level influences on perceptions of neighborhood disorder: a multilevel analysis. *Journal of Community Psychology*. 2009; 37(1):122–133. [PubMed: 20027234]
- LaVeist T, Pollack K, Thorpe R, Fesahazion R, Gaskin D. Place, Not Race: Disparities Dissipate In Southwest Baltimore When Blacks And Whites Live Under Similar Conditions. *Health Affairs*. 2011; 30(10):1880–1887.10.1377/hlthaff.2011.0640 [PubMed: 21976330]
- Lazarus, R.; Folkman, S. *Stress, Appraisal and Coping*. New York: Springer; 1984.
- Li, J.; Raudenbush, SW.; Spybrook, J.; Congdon, R.; Martinez, A. *Optimal design for multi-level and longitudinal research (Version 1.77)*. University of Michigan, Survey Research Center: HLM Software; 2006.
- Massey DS, Denton NA. Hypersegregation in U.S. Metropolitan Areas: Black and Hispanic Segregation along Five Dimensions. *Demography*. 1989; 26(3):373–391. [PubMed: 2792476]
- Massey, DS.; Denton, NA. *American Apartheid: Segregation and the making of the underclass*. Cambridge, MA: Harvard University Press; 1993.
- McClelland GH, Judd CM. Statistical difficulties of detecting interactions and moderator effects. *Psychological Bulletin*. 1993; 114(2):376. [PubMed: 8416037]
- McEwen B, Seeman T. Protective and damaging effects of mediators of stress. *Annals New York Academy of Science*. 1999; 896:30–47.
- Merkin SS, Basurto-Dáviola R, Karlamangla A, Bird C, Lurie N, Escarce J, Seeman T. Neighborhoods and cumulative biological risk profiles by race/ethnicity in a national sample of U.S. adults: NHANES III. *Annals of Epidemiology*. 2009; 19:194–201. [PubMed: 19217002]
- Myers H. Ethnicity- and socio-economic status-related stresses in context: an integrative review and conceptual model. *Journal of Behavioral Medicine*. 2009; 32:9–19. [PubMed: 18989769]
- Nakao, K.; Treas, J. *GSS Methodological Report 70*. Vol. 70. Chicago: National Opinion Research Center; 1990. Computing 1989 occupational prestige scores.
- Pearlin L. The sociological study of stress. *Journal of Health and Social Behavior*. 1989; 30(3):241–256. [PubMed: 2674272]
- Pearlin L, Schieman S, Fazio E, Meersman S. Stress, health, and the life course: Some conceptual perspectives\*. *Journal of Health and Social Behavior*. 2005; 46(2):205–219. [PubMed: 16028458]
- Pearlin LI, Schooler C. The structure of coping. *Journal of Health and Social Behavior*. 1978; 19(1):2–21. [PubMed: 649936]
- Prentice DA, Miller DT. When small effects are impressive. *Psychological Bulletin*. 1992; 112(1):160.
- Procidano M, Heller K. Measures of perceived social from friends and from family: Three validation studies. *Journal of Community Psychology*. 1983; 11:1–24.
- Repetto PB, Zimmerman MA, Caldwell CH. A longitudinal study of the relationship between depressive symptoms and alcohol use in a sample of inner-city black youth. *Journal of Studies on Alcohol*. 2004; 65(2):169–178. [PubMed: 15151346]
- Ross CE, Jang S. Neighborhood disorder, fear, and mistrust: The buffering role of social ties with neighbors. *American Journal of Community Psychology*. 2000; 28(4):401–420. [PubMed: 10965384]

- Ross CE, Mirowsky J. Disorder and decay: The concept and measurement of perceived neighborhood disorder. *Urban Affairs Review*. 1999; 34(3):412–432.
- Sampson R, Raudenbush S, Earls F. Neighborhoods and crime: A multilevel study of collective efficacy. *Science*. 1997; 277:918–924. [PubMed: 9252316]
- Schmeelk-Cone KH, Zimmerman M. A longitudinal analysis of stress in African American youth: predictors and outcomes of stress trajectories. *Journal of Youth and Adolescence*. 2003; 32(6): 419–430.
- Segerstrom S, Miller G. Psychological stress and the human immune system: A meta-analytic study of 30 years of inquiry. *Psychological Bulletin*. 2004; 130(4):601–630. [PubMed: 15250815]
- Sellers SL, Neighbors HW. Effects of goal-striving stress on the mental health of black Americans. *Journal of Health and Social Behavior*. 2008; 49:92–103. [PubMed: 18418987]
- Stancil TR, Hertz-Picciotto I, Schramm M, Watt-Morse M. Paediatric and perinatal epidemiology. 2000; 14(2):127. [PubMed: 10791655]
- Stockdale S, Wells K, Tang L, Belin T, Zhang L, Sherbourne C. The importance of social context: Neighborhood stressors, stress-buffering mechanisms, and alcohol, drug, and mental health disorders. *Social Science & Medicine*. 2007; 65:1867–1881. [PubMed: 17614176]
- Thoits P. Stress, coping and social support processes: Where are we? What next? *The Journal of Health and Social Behavior*. 1995; 35:53–79.
- Turner HA, Turner RJ. Understanding Variations in Exposure to Social Stress. *Health*. 2005; 9(2): 209–240. [PubMed: 15788434]
- Wandersman A, Nation M. Urban neighborhoods and mental health: Psychological contributions to understanding toxicity, resilience and interventions. *American Psychologist*. 1998; 53(6):647–656. [PubMed: 9633265]
- Weigel D, Devereux P, Leigh G, Ballard-Reisch D. A longitudinal study of adolescents' perceptions of support and stress: Stability and change. *Journal of Adolescence Research*. 1998; 13:158–177.
- Wen M, Cagney K, Christakis N. Effect of specific aspects of community social environment on the mortality of individuals diagnosed with serious illness. *Social Science & Medicine*. 2005; 61:1119–1134. [PubMed: 15970225]
- Wenzel, L.; Glanz, K.; Lerman, C. Stress, coping and health behavior. In: Glanz, K.; Rimer, B.; Lewis, F., editors. *Health Behavior and Health Education*. 3. San Francisco: Jossey-Bass; 2002. p. 210-239.
- West, BT.; Welch, KB.; Galecki, AT. *Linear Mixed Models*. 1. Boca Raton: Taylor & Francis, Inc; 2006.
- Wheaton B, Clarke P. Space meets time: Integrating temporal and contextual influences on mental health in early adulthood. *American Sociological Review*. 2003; 68(5):680–706.
- Wodtke GT, Harding DJ, Elwert F. Neighborhood Effects in Temporal Perspective. *American Sociological Review*. 2011; 76(5):713–736. 10.1177/0003122411420816 [PubMed: 22879678]
- Xue Y, Zimmerman MA, Caldwell CH. Neighborhood residence and cigarette smoking among urban youths: The protective role of prosocial activities. *American Journal of Public Health*. 2007; 97:1865. [PubMed: 17761584]
- Yen IH, Kaplan GA. Neighborhood Social Environment and Risk of Death: Multilevel Evidence from the Alameda County Study. *Am J Epidemiol*. 1999; 149(10):898–907. [PubMed: 10342798]
- Yinger, J. *Closed doors, opportunities lost: The continuing costs of housing discrimination*. New York: Russell Sage Foundation; 1995.
- Zimmerman, M.; Brenner, A. Resilience in Adolescence: Overcoming neighborhood disadvantage. In: Reich, J.; Zautra, A.; Hall, J., editors. *Handbook of Adult Resilience: Concepts, Methods, and Applications*. New York: Guilford Press; 2009. p. 283-308.
- Zimmerman MA, Salem DA, Maton KI. Family Structure and Psychosocial -Correlates among Urban African American Adolescent Males. *Child Development*. 1995; 66(6):1598–1613. [PubMed: 8556888]



**Figure 1. Effect of neighborhood disadvantage on perceived stress trajectory**  
 Changes in perceived stress between Wave 2 and Wave 8 for three levels of neighborhood socio-economic disadvantage (low, medium, high). Age 0 corresponds to baseline when participants were 15.9 years old on average. Note: The y-axis is somewhat truncated in order to illustrate the shape of the lines more clearly, as the effects were small but significant.

**Table 1**

Means (SD)/Frequency(%) of time varying predictors

	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6	Wave 7	Wave 8
Perceived stress	2.53 (0.57) N=646	2.48 (0.60) N=627	2.52 (0.62) N=611	2.37 (0.59) N=465	2.46 (0.59) N=504	2.44 (0.55) N=459	2.46 (0.56) N=470
Substance use <sup>a</sup>	-0.03 (0.83) N=639	0.00 (0.79) N=620	-0.03 (0.78) N=604	-0.01 (0.79) N=473	-0.01 (0.74) N=511	-0.03 (0.74) N=461	-0.00 (0.74) N=470
High effort coping	4.21 (0.57) N=649	4.23 (0.54) N=627	4.23 (0.62) N=613	4.23 (0.59) N=471	4.23 (0.59) N=514	4.23 (0.59) N=462	4.18 (0.61) N=470
Mother support	4.01 (0.96) N=639	4.10 (0.95) N=614	4.03 (0.99) N=595	4.03 (1.02) N=447	4.00 (1.01) N=483	3.96 (1.02) N=437	3.99 (1.05) N=436
Friend support	3.33 (0.97) N=648	3.28 (0.94) N=627	3.24 (0.98) N=613	3.27 (0.93) N=449	3.27 (0.93) N=508	3.12 (1.00) N=444	3.17 (1.02) N=456
Relationship support	—	—	—	4.33 (0.65) N=468	4.42 (0.60) N=503	4.38 (0.64) N=460	4.41 (0.66) N=467
Neighborhood attitudes	2.78 (0.78) N=646	2.76 (0.78) N=623	2.63 (0.77) N=613	2.53 (0.78) N=468	2.48 (0.77) N=510	2.52 (0.77) N=452	2.57 (0.75) N=463
Fear of neighborhood violence	226 (34.8%) N=649	206 (32.8%) N=628	153 (24.9%) N=614	180 (38.3%) N=470	191 (37.2%) N=514	153 (33%) N=463	163 (34.8%) N=469
Worry get hurt in neighborhood	136 (21%) N=649	102 (16.2%) N=628	85 (13.8%) N=614	96 (20.3%) N=472	107 (20.9%) N=513	91 (19.7%) N=463	100 (21.3%) N=469

Note. Data on relationship support were not obtained in Waves 2–4

<sup>a</sup>Numbers represent standardized values

**Table 2**

Changes in perceived stress and time varying covariates and effect of neighborhood disadvantage on the stress trajectory

	Model 1 B (SE)	Model 2 B (SE) [95% CI]	Model 3 B (SE)	Model 4 B (SE)
Fixed effects				
Mean stress at baseline ( $\beta_0$ )	1.65 (0.03) [1.59, 1.72]	1.63 (0.03) [1.61, 1.73]	2.53 (0.27) [1.88, 2.93]	2.38 (0.27) [1.85, 2.91]
Neigh. disadvantage	0.05 (0.02) [-0.00, 0.10]	0.04 (0.02) <sup>c</sup> [-0.01, 0.10]	NS	NS
SES	-0.004 (0.00) [-0.01, -0.00]	-0.003 (0.00) [-0.01, -0.00]	-0.00 (0.00) [-0.01, 0.00]	-0.00 (0.00) [-0.01, -0.00]
Male	-0.18 (0.03) [-0.25, -0.12]	-0.20 (0.03) [-0.27, -0.14]	-0.12 (0.04) [-0.20, -0.05]	-0.11 (0.04) [-0.18, -0.04]
Mean growth ( $\pi_1$ )	-0.05 (0.01) [-0.07, -0.02]	-0.05 (0.01) [-0.07, -0.03]	NS	NS
Neigh. disadvantage	-0.01 (0.00) [-0.02, -0.00]	-0.01 (0.00) [-0.02, -0.00]	NS	NS
Mean acceleration ( $\pi_2$ )	0.004 (0.00) [0.00, 0.01]	0.004 (0.00) [0.00, 0.01]	NS	NS
Substance use		0.07 (0.01) [0.05, 0.09]	0.04 (0.02) [0.00, 0.06]	0.04 (0.02) [0.01, 0.07]
John Henryism			-0.26 (0.03) [-0.31, -0.21]	-0.25 (0.03) [-0.30, -0.20]
Mother support			-0.04 (0.01) [-0.06, -0.01]	-0.03 (0.01) [-0.06, -0.01]
Friend support			NS	NS
Relationship support			-0.10 (0.02) [-0.14, -0.05]	-0.09 (0.02) [-0.14, -0.05]
Neighborhood attitudes				-0.04 (0.02) [-0.07, -0.00]
Fear of neighborhood violence				NS
Worry about getting hurt in neighborhood				0.13 (0.03) [0.08, 0.18]
Random effects of mean growth ( $\pi_1$ )				
Variance (SD)	0.0003 (0.02)	0.003 (0.02)	NS	NS
$\chi^2$ (DF) <sup>a,b</sup>		89.22 (1)	2932.96 (3)	79.28 (2)

Note. NS=Non-significant.

<sup>a</sup>Degrees of freedom based on number of cases used in computation of random effects

<sup>b</sup>Model comparison based on nested models

<sup>c</sup>p=0.06