Topic 1. Structural Patterns of Health Inequalities

Do Daily Stress Processes Account for Socioeconomic Health Disparities?

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Objectives. The present study examined the extent to which daily stressor severity and appraisals of the stressors accounted for socioeconomic disparities in health.

Methods. Data from the National Study of Daily Experiences and the Midlife in the United States Survey were combined for the current analyses, resulting in 1,031 respondents who reported on 7,229 days.

Results. Respondents without a high school degree experienced more severe stressors and appraised stressors as posing greater risk to their financial situation and to their self-concept than respondents with a high school or college degree. Differences in severity and stressor appraisal accounted for education differences in psychological distress and physical health symptoms.

Discussion. Findings suggest the importance of considering variation across stressors, particularly implications for self-concept, in understanding sources of differential stressor vulnerability.

EXPOSURE and vulnerability to stressors are perhaps the most common explanations for socioeconomic disparities in physical and mental health (e.g., House & Williams, 2000; Kessler, 1979; Pearlin, 1989). Individuals in lower socioeconomic groups are more likely to experience both acute and chronic stressful events. Such stressor exposure may be due to several reasons ranging from prejudice, racism, and discrimination to low income and poor living conditions (Turner & Lloyd, 1999). Individuals on the lower rungs of the socioeconomic ladder may also be more vulnerable to the effects of stressors. Given similar stressors, lower-status individuals are more likely to experience negative health consequences due to a lack of material and psychological coping resources (Adler et al., 1994). Much of the work establishing differential exposure and vulnerability to stress, however, has focused on stressful life events (e.g., Aneshensel, 1992; Kessler & Cleary, 1980) or chronic stressors (e.g., Turner & Lloyd, 1999). The purpose of this article is to assess how characteristics of daily stressors may account for socioeconomic disparities in health.

Daily stressors are defined as minor events arising out of day-to-day living, such as the everyday concerns of work, caring for others, and commuting between work and home. They represent tangible, albeit minor, interruptions that may have a more proximal effect on well-being than major life events (Almeida, 2005). In terms of their physiological and psychological effects, reports of life events may be associated with prolonged arousal, whereas reports of daily stressors may be associated with spikes in arousal or psychological distress that day. In addition, minor daily stressors exert their influence not only by having separate and immediate direct effects on emotional and physical functioning, but also by piling up over a series of days to create persistent irritations, frustrations, and overloads that may result in more serious stress reactions such as anxiety and depression (Lazarus, 1999; Zautra, 2003).

The study of daily stressors offers unique insight into the ordinary circumstances that may sustain and exacerbate social inequalities in health. We have done a series of analyses assessing how education is associated with global daily stress processes (Grzywacz, Almeida, Neupert, & Ettner, 2004). Consistent with the broad literature describing socioeconomic inequalities in physical and mental health, the results of this study indicated that better-educated adults reported fewer daily physical symptoms and less daily psychological distress. In contrast to previous studies, however, stressor exposure increased with greater levels of education. College-educated individuals reported more daily stressors than those with high school or less education. However, college-educated respondents were less vulnerable to stressors. On days when individuals reported no stressors, there were no education differences in psychological distress and physical health symptoms. On days individuals experienced stressors, those with less education reported greater levels of psychological distress and physical symptoms compared with their better-educated counterparts. Taken together, these findings suggest that socioeconomic differentials in daily health could be attributed to differential vulnerability to stressors rather than to differential stressor exposure.

These previous analyses, however, examined only global characteristics of daily stressors (e.g., frequency). It is unclear

how the specific stressor characteristics relate to socioeconomic status (SES) differences in health. Therefore, in the present investigation, we sought to extend the findings of Grzywacz and colleagues (2004) by examining whether stressor severity ratings and appraisals were important in explaining some of the SES differences in daily psychological distress and physical health symptoms across the adult lifespan. Less-educated individuals may be more vulnerable to daily stressors because their stressors are more severe and are appraised as more disruptive to daily goals and commitments (Adler et al., 1994). Foul weather, for example, may be an unpleasant nuisance to a business professional, but it can be dangerous or a day without pay for an outdoor laborer. Thus, the severity of the stressor as well as its implication for disrupting routines as well as risking safety and financial situations are likely to be linked to social status and health, even if exposure to the stressor itself is not.

The understanding of daily stressors has benefited from the development of diary methods that obtain repeated measurements from individuals during their daily lives (Bolger, Davis, & Rafaeli, 2003). Perhaps the most valuable feature of diary methods is the ability to assess within-person processes. This represents a shift from assessing mean levels of stressor and well-being between individuals to charting the day-to-day fluctuations in stress and well-being within an individual (Larson & Almeida, 1999). Given ample evidence indicating that people who are under stress experience more health problems (Cohen & Herbert, 1996), within-person associations between stress and health are frequently inferred from between-person designs. However, between-person associations can mask variation in within-person associations in terms of both magnitude and direction (Tennen, Affleck, Armeli, & Carney, 2000), suggesting that inferences from previous studies of somatic or psychiatric vulnerability to stressors by SES may be tenuous. In short, it is important to complement previous sociological stress and health research with designs that allow stronger inferences of within-person associations and the between-person factors that may affect these associations.

In summary, the goals of this article are to extend previous analyses on the role of daily stress in SES disparities in health. In particular, we assess whether individuals with lower levels of education appraise stressors as more severe as well as pose more risk to specific domains of daily life (e.g., daily routines, threats to safety). We also assess the extent to which stressor severity and appraisal differences account for SES differences in daily reports of psychological distress and physical symptoms.

METHOD

Sample

Data for the analyses are from the National Study of Daily Experiences (NSDE). Respondents were 1,031 adults (562 women, 469 men), all of whom had previously participated in the National Survey of Midlife Development in the United States (MIDUS), a nationally representative telephone–mail survey of 3,032 people, aged 25–74 years. Respondents in the NSDE were randomly selected from the MIDUS sample and received $20 for their participation in the project. Over the course of 8 consecutive evenings, respondents completed short telephone interviews about their daily experiences. Data collection spanned an entire year (March 1996 to April 1997) and consisted of 40 separate "flights" of interviews, with each flight representing the 8-day sequence of interviews from approximately 38 respondents. The initiation of interview flights was staggered across the day of the week to control for the possible confounding between day of study and day of week. Of the 1,242 MIDUS respondents we attempted to contact, 1,031 agreed to participate, yielding a response rate of 83%. Respondents completed an average of 7 of the 8 interviews, resulting in a total of 7,229 daily interviews.

The NSDE subsample and the MIDUS sample from which it was drawn had very similar distributions for age, marital status, and parenting status (for a complete description, see Almeida, Wethington, & Kessler, 2002). The NSDE sample had a slightly greater percentage of women (54.5% vs 51.5% of the samples, respectively), was better educated (60.8% of the MIDUS sample had at least 13 years of education vs 62.3% of the NSDE subsample), and had a smaller percentage of minority respondents than the MIDUS sample. Of the NSDE sample, 90.3% were Caucasian, 5.9% African American, and 3.8% all other races versus 87.8% Caucasian, 6.8% African American, and 4.4% all other races for the MIDUS sample. Respondents for the present analysis were on average 47 years old. Thirty-eight percent of the households reported having at least one child under 18 years old in the household. The average family income was between $50,000 and $55,000. Men were slightly older than women, had similar levels of education, and were more likely to be married at the time of the study (77% of the women vs 85% of the men).

Measures

SES was operationalized as a series of dichotomous indicators of educational attainment representing less than high school education ($n = 78$; reference category), high school or some college ($n = 642$), and college graduate ($n = 311$). This strategy was chosen because it captures the well-established gradient of socioeconomic disadvantage (Marmot, Ryff, Bumpass, Shipley, & Marks, 1997), and it captures the primary educational benchmarks that provide the foundation for subsequent stratification processes by occupation and earnings (Marks & Shinberg, 1998). Moreover, educational attainment has been the primary proxy for SES used in previous studies, thereby allowing comparability with other studies; it is less prone to exhibiting missing data values; it is relatively stable across the life course after early adulthood; and it is more comparable across men and women than occupation and more comparable across single and married persons than income. Most importantly, education is less prone to endogeneity bias from reverse causality (e.g., health affecting the SES measure) than measures such as income and occupation.

Daily psychological distress was operationalized using an inventory of 10 emotions expanded from the psychological distress scale designed for the MIDUS survey (Mroczek & Kolarz, 1998) and queried during each telephone interview. This scale was developed from the following well-known and valid instruments: Affect Balance Scale (Bradburn, 1969), the University of Michigan Composite International Diagnostic Interview (Kessler et al., 1994), the Manifest Anxiety Scale

(Taylor, 1953), and the Center for Epidemiological Studies Depression Scale (Radloff, 1977). Respondents were asked how much of the time today did they feel: worthless, hopeless, nervous, depressed, restless or fidgety, that everything was an effort, tired out for no good reason, so nervous that nothing could calm you down, so restless that you could not sit still, or so sad that nothing could cheer you up. Response categories for the index items were as follows: $1 =$ none of the time, $2 =$ a little of the time, $3 =$ some of the time, $4 =$ most of the time, and $5 =$ all of the time. Scores across the 10 items were summed ($\alpha = .89$).

Daily physical symptoms were measured using a shortened version of Larsen and Kasimatis's (1991) physical symptom checklist. Items that overlapped with the psychological distress scale (e.g., "urge to cry") were omitted. Our five-item scale assessed five constellations of symptoms: aches/pain (headaches, backaches, and muscle soreness), gastrointestinal symptoms (poor appetite, nausea/upset stomach, constipation/diarrhea), chest pain or dizziness (symptoms often associated with cardiovascular functioning), flu symptoms (upper respiratory symptoms, sore throat, runny nose, fever, chills), and a category for "other" physical symptoms or discomforts. Open-ended responses to the other physical symptoms question were subsequently coded and placed into an existing category, deleted if the symptom was psychological (e.g., felt anxious), or left in a miscellaneous category if no other category existed. Each day the respondents indicated how frequently they experienced each symptom over the last 24 hours on a 5-point scale where $1 =$ none of the time, $2 =$ a little of the time, $3 =$ some of the time, $4 =$ most of the time, and $5 =$ all of the time. Scores across the five items were summed ($\alpha = .71$).

Daily stressors were assessed through a semistructured Daily Inventory of Stressful Events (DISE; Almeida et al., 2002). The instrument contains seven "stem" questions for identifying whether stressful events occurred in various life domains as well as a series of questions for probing affirmative responses (see Almeida et al. [2002] for a detailed description of the stem questions and examples of probes). Almeida and colleagues' (2002) analyses highlight several descriptive features of DISE measures that are highly relevant to the current study. First, respondents reported experiencing at least one stressor on 37.8% of the interview days, and multiple stressors were reported on 1 in 10 interview days. Next, the most common form of daily stress for women and men was interpersonal stressors, followed by work stressors for men and network stressors for women. Finally, although subjective and objective severity ratings of stressors are based on the same experience, the association between these measures was modest ($r = .36$). Thus, the DISE produces estimates of daily stressors with ample variation, and objective and subjective characterizations of stressor severity appear to be relatively independent of each other.

For each daily interview, individuals who responded affirmatively to any of the stem questions received a value of 1 on an indicator variable of any stress and were coded 0 otherwise. Respondents' narrative responses to investigator probes provided objective information on the content of the stressful experiences as well as the meaning of the stressor for the respondent. Objective severity, similar to Brown and Harris' (1978) ratings of short-term contextual threat, was assigned by trained coders based upon the degree of disruptiveness and unpleasantness associated with the stressor. Coders' scores ranged from a minor or trivial annoyance (1) to a severely disruptive event (4). Interrater reliability (kappa) on the objective severity measure was .75. Subjective severity reflects respondents' assessments of each stressful event on a 4-point scale ranging from "not at all stressful" to "very stressful."

Appraisals: domains of risk.—Respondents also reported on the degree of risk the stressor posed to specific areas of the respondent's personal life, expanding on Lazarus's (1999) domains of primary appraisal. Response choices ranged from 1 (not at all at risk) to 4 (at risk a lot). The areas of risk included (a) plans for the future, (b) finances, (c) how respondent feels about self, (d) how others feel about respondent (perceptions by others), (e) personal health or safety, and (f) disruption of daily routine.

RESULTS

The initial set of analyses examined SES differences in stressor severity and appraisal via a series of one-way analyses of variance with Tukey honestly significant differences post hoc comparisons. SES differences were apparent in the stressor severity ratings. Respondents who did not graduate from high school experienced more severe daily stressors than those who had graduated from high school or college according to our objective coders ($F [2, 884] = 11.42, p < .001$) as well as respondents' subjective severity ratings ($F [2, 910] = 6.83, p < .01$). In terms of domains of appraisal, there were SES differences in stressors that posed a risk to finances ($F [2, 755] = 4.74, p < .01$) and feelings about self ($F [2, 755] = 15.06, p < .001$), with those who did not graduate from high school reporting higher risk than those who graduated from high school or college. Stressors that posed a risk to one's daily routine, personal health, and plans for the future did not differ by levels of education.

Bivariate correlations were conducted to assess the strength of the associations among the stressor variables (i.e., severity and appraisal domains) and the outcome variables (i.e., psychological distress and physical symptoms). The results are presented in Table 1. Although the intercorrelations among the appraisal domains were generally low, there were three moderate correlations. The association between appraised risk to finances and plans for the future ($r = .47, p < .001$) suggests that current risks to material resources may be offset by changes to future plans. The association between feelings about self and perceptions by others ($r = .40, p < .001$) may reflect the fact that 63% of the daily stressors involved another person. Finally, there was a moderate correlation between appraised risks to feelings about self and personal health ($r = .30, p < .001$). Given that the correlations among the stressor variables were generally low to moderate, we concluded that multicollinearity among the variables would not bias subsequent analyses.

Daily Level Analysis

Our main set of analyses examines the potential roles that stressor characteristics may have on daily well-being and their

Table 1. Between-Person Correlations Among Variables of Interest

Variables	1	2	3	4	5	6	7	8	9
1. Psychological distress	—								
2. Physical symptoms	.36***	—							
3. Objective severity	.14***	.07*	—						
4. Subjective severity	.32***	.17***	.38***	—					
5. Daily routine	.28***	.13**	.18***	.29***	—				
6. Finances	.13***	.03	.16***	.14***	.23***	—			
7. Feelings about self	.27***	.10**	.12**	.20***	.29***	.16***	—		
8. Perceptions by others	.26***	.01	.02	.16***	.28***	.08*	.40***	—	
9. Personal health	.24***	.16***	.12**	.20***	.28***	.25***	.30***	.17**	—
10. Plans for the future	.16***	.06	.17***	.12**	.25***	.47***	.29***	.19***	.26***

Notes: $n = 907$ people, based on 2,732 stressor days.
*$p < .05$; **$p < .01$; ***$p < .001$.

importance for SES differences in health. To maximize data that were gathered through a daily diary design, multilevel modeling was implemented for analysis (Raudenbush & Bryk, 2002). The goal of the analyses was to examine SES differences in vulnerability to daily stressors. Thus, we assessed SES differences in psychological distress and physical symptoms on days when respondents experienced stressors. These analyses were based on the following general model:

$$\text{Distress}_{it} = b_0 + b_1(\text{Education}_i) + b_2(\text{Stressor Severity}_{it}) + b_3(\text{Stressor Appraisal}_{it}) + c_i + d_{it}$$

where Distress_{it} represents the reported psychological distress for respondent i on stressor day t (only days when respondents reported a stressor were used for the analyses), Education_i is the level of education for respondent i (coded as two dummy variables: graduated high school and graduated college), $\text{Stressor Severity}_{it}$ is the level of disruption and unpleasantness (obtained from trained coders and the respondents' subjective reports) posed by stressors for respondent i on day t, $\text{Stressor Appraisal}_{it}$ indicates the degree of risk in various life domains posed by stressors experienced by respondent i on day t, c_i is random variation in the individuals, and d_{it} is the random variation in the diary days. The model was re-estimated with physical symptoms as the outcome variable. It is important to point out that this estimation procedure takes into consideration

the amount of data available from each person, so that missing data on some occasions are taken into account by giving more weight to persons with complete data than those with some missing data (Dempster, Laird, & Rubin, 1977). Based on this feature of the analysis method, data analysis will work with respondent records even if they reported stressors on only 2 of the 8 diary days. Missing days in the middle of the series, such as when a respondent completed interviews on days 1–4 and 7–8 but missed days 5–6, can be handled in the same way. Thus, instead of deleting all of the respondent's data because of a missed interview, this approach has the advantage of using all available data from a given respondent.

Tables 2 and 3 present the results of these multilevel analyses. Model 1 in each table represents the SES disparities in psychological distress and physical symptoms, respectively, Model 2 adds the objective and subjective severity ratings, and Model 3 adds the appraisal domains. Comparison of Model 1 with Models 2 and 3 of the analysis tested for possible mediating effects of stressor appraisal on education differences in psychological distress and physical symptoms (Baron & Kenny, 1986; Kenny, Kashy, & Bolger, 1998). Table 2 presents the results for psychological distress. Model 1 shows that respondents with less than a high school degree experienced more frequent psychological distress on stressor days than their better-educated counterparts. Specifically, they scored 2.44 units higher on the distress scale than those with a high school

Table 2. Multilevel Models: Psychological Distress on Stressor Days

Predictor Variables	Model 1	Model 2	Model 3
Less than high school	Reference	Reference	Reference
High school or some college	−2.44** (.76)	−1.97** (.76)	−.87 (.93)
College graduate	−3.55*** (.79)	−2.85*** (.79)	−1.88 (.97)
Objective severity		.04 (.16)	−.16 (.22)
Subjective severity		1.80*** (.17)	1.51*** (.35)
Appraisals			
Daily routine			.48** (.17)
Finances			.09 (.25)
Feelings about self			.97*** (.22)
Perceptions by others			.20*** (.22)
Personal health			.65* (.26)
Plans for the future			.46* (.23)

Notes: $n = 2,730$ days when respondents reported experiencing a stressor.
*$p < .05$; **$p < .01$; ***$p < .001$.

Table 3. Multilevel Models: Physical Health Symptoms on Stressor Days

Predictor Variables	Model 1	Model 2	Model 3
Less than high school	Reference	Reference	Reference
High school or some college	−.40 (.31)	−.14 (.32)	−.09 (.38)
College graduate	−.94** (.32)	−.66* (.33)	−.63 (.40)
Objective severity		.11 (.07)	−.17 (.09)
Subjective severity		.31*** (.07)	.01 (.15)
Appraisals			
Daily routine			.13 (.07)
Finances			−.19 (.10)
Feelings about self			.13 (.09)
Perceptions by others			.01 (.09)
Personal health			.41*** (.11)
Plans for the future			.10 (.10)

Notes: $n = 2,732$ days when respondents reported experiencing a stressor.
*$p < .05$; **$p < .01$; ***$p < .001$.

degree or some college and 3.55 units higher than those with a college degree. Model 2 indicates that subjective stressor severity was related to psychological distress and partially mediated the SES disparity, decreasing the education effect by 20%. Finally, when the appraisal domains were added in Model 3, the SES disparity was further reduced and was no longer statistically significant. Subjective severity, threats to one's daily routine, feelings about self, others' perceptions, health, and plans for the future were related to daily psychological distress.

Table 3 presents results for daily physical symptoms. Model 1 suggests that respondents with less than a high school degree experienced more frequent physical symptoms on stressor days compared with those with a college degree. Specifically, those with less than a high school degree scored .94 unit higher on the physical symptom scale than those with a college degree. Subjective stressor severity was related to physical symptoms and partially mediated the SES disparity, accounting for 30% of the education effect (see Model 2 of Table 3). When the appraisal domains were added in Model 3, the only salient predictor of daily physical symptoms on stressor days was the appraisal of threat to personal health (see Model 3 of Table 3).

DISCUSSION

Consistent with previous research on health disparities, this article demonstrates clear evidence for SES differences in vulnerability to daily stressors. On days respondents experienced stressors, less-educated individuals reported greater psychological distress and more physical symptoms than their better-educated counterparts. The goal of this work was to extend these findings by examining whether variations in severity and stressor appraisal account for such vulnerability. One source of differential vulnerability is that less-educated individuals experience more severe daily stressors. The present analyses show that respondents without a high school degree perceived their stressors as more stressful. In addition, expert ratings of detailed descriptions of the stressors revealed the same pattern. Results from the multilevel models indicated the differential stressor severity accounts for some, but not all, of the differential vulnerability to daily stressors. After stressor severity was taken into account, the education effects on psychological distress and physical symptoms were diminished by 20% and 30%, respectively. Although attenuated, the education effects on daily distress and symptoms were still statistically significant.

Another source of differential stressor vulnerability lies in the appraised risk stressors pose to individuals in lower-status groups. Compared with their better-educated counterparts, respondents without a high school degree reported that daily stressors were more likely to pose risks to their financial situation and the way respondents felt about themselves (i.e., self-concept). Stressor appraisal also plays an important role in daily well-being. After controlling for stressor severity, the inclusion of the appraisal variables further reduced the education effect on psychological distress and physical symptoms by an additional 34% and 8%, respectively. Taken together, severity and stressor appraisal partially mediated the SES disparity observed in daily psychological distress and physical symptoms. These findings point to the importance of considering variations in the type of stressors individuals face and how they are perceived.

Finally, daily stressors that pose risk to individual's self-concept appear to play a unique role in differential vulnerability to daily stressors. The stressors that lower-educated people face pose great risk to the way they see themselves, and as such self-concept appraisal is also a significant predictor of daily psychological distress. Such results are consistent with a recent meta-analysis of acute psychological stressors and cortisol activation (Dickerson & Kemeny, 2004). Across these studies, there was a substantial degree of variability in the magnitude of the cortisol effects, depending on the characteristics of the stressor. These authors posit a theory of social self-preservation where threats to status elicit stronger physiological reactions. The social self-preservation system monitors the environment for threats to one's social esteem or social status and coordinates psychological, physiological, and behavioral responses to cope with the threats. Responses to the threats include increases in negative self-evaluations (i.e., negative self-related cognitions and emotions), increases in cortisol, and changes in other physiological parameters.

Conclusion

This article takes a microanalytic approach to the study of health differential and vulnerability to stress by considering characteristics of daily stressors. The findings indicate that the severity and meaning of daily stressors differ by levels of education and may be partly responsible for SES differentials in health. Future research would benefit from considering variation in stressors as well as differences in the resources that individuals bring to their daily lives.

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