Stress, Life Events, and Socioeconomic Disparities in Health: Results from the Americans' Changing Lives Study*

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Journal of Health and Social Behavior 2005, Vol 46 (September): 274–288

It has been hypothesized that exposure to stress and negative life events is related to poor health outcomes, and that differential exposure to stress plays a role in socioeconomic disparities in health. Data from three waves of the Americans' Changing Lives study (n = 3,617) were analyzed to investigate prospectively the relationship among socioeconomic indicators, five measures of stress/negative life events, and the health outcomes of mortality, functional limitations, and self-rated health. The results revealed that (1) life events and other types of stressors are clearly related to socioeconomic position; (2) a count of negative lifetime events was positively associated with mortality; (3) a higher score on a financial stress scale was predictive of severe/moderate functional limitations and fair/poor self-rated health at wave 3; and (4) a higher score on a parental stress scale was predictive of fair/poor self-rated health at wave 3. The negative effects of low income on functional limitations attenuated to insignificance when waves 1 and 2 stress/life event measures were controlled for, but other socioeconomic disparities in health change remained sizable and significant when adjusted for exposure to stressors. The results support the hypothesis that differential exposure to stress and negative life events is one of many ways in which socioeconomic inequalities in health are produced in society.

Increasingly, recognition is being given to psychosocial determinants of health and health disparities in both research and policy (House 2002; Marmot 1999; Tarlov 1999). These determinants include health behaviors, social relationships and supports, psychological dispositions (e.g., self-efficacy, hostility, etc.), and acute and chronic stress (House and Williams 1995; Miller et al. 1996; Pearlin 1989). Prior research has established that most of these psychosocial risk factors are patterned by socioeconomic position (Adler and Ostrove 1999; House and Williams 1995; Marmot et al. 1998; Wilkinson 1999). It also appears that adjusting for a broad range of psychosocial factors can potentially explain a significant portion of socioeconomic and racial/ethnic disparities in health (House et al. 1994; Lynch et al. 1996).

There is growing empirical evidence that exposure to stress and resulting stress reactions are linked with a variety of deleterious health effects (Dohrenwend 2000; Kelly, Hertzman, and Daniels 1997; Thoits 1995). Increased levels of stress and negative life events among

* This article was supported by National Institute on Aging grant R01AG018418. We thank the members of the Americans' Changing Lives Work Group at the University of Michigan for providing useful comments on a previous draft and Barb Strane for administrative support. Address correspondence to Paula M. Lantz, University of Michigan School of Public Health, 109 Observatory, Ann Arbor, MI 48109-2029 (email: plantz@umich.edu).

those in lower socioeconomic strata are also posited to be important not only as determinants of health, but also as mechanisms by which socioeconomic inequalities in physical (Baum, Garofalo, and Yali 1999) and mental (Turner and Avison 2003) health are produced. However, little evidence from prospective population-based studies is available in support of this hypothesis, especially with respect to serious physical health outcomes. Thus, using data from a nationally representative study of U.S. adults, we investigated the prospective relationship between exposure to a broadly defined set of social stressors and three different physical health outcomes, and we assessed the degree to which stress and negative life events can explain socioeconomic differentials in these outcomes.

THEORY

The Impact of Stress and Life Events on Health

When a person perceives a stressor, a "stress reaction" can occur, involving physiological or emotional arousal and a set of neural and hormonal adaptations that attempt to restore homeostatis (Kelly et al. 1997; Thoits 1995). Repeated or prolonged elevation of the body's stress response systems (including neural, neuroendocrine, and immune systems) can produce a physiological state referred to as "allostasis" (McEwan and Seeman 1999). "Allostatic load" refers to the "wear and tear" of allostasis on the body's stress response systems, which in the long run causes physiologic changes in the body—most notably in the immune system and brain—that in turn can lead to disease through a variety of biological mechanisms (Baum et al. 1999; Kelly et al. 1997).

Cohen, Kessler, and Gordon (1995) postulate a heuristic model of the stress process that integrates environmental demand perspectives, psychological perspectives (which focus on perception, appraisal, and response processes), and biological models (which focus on the activation of physiological systems in response to repeated demands). This unifying model suggests that environmental demands can lead to physiological or behavioral responses that increase one's risk of illness, with the appraisal of demands and adaptive/coping behaviors as critical mediating factors. Environmental demands include acute life events, chronic strains, and daily hassles, all of which can elicit a stress response, suggesting that it is not just dramatic events but also the many events of daily life that can exact a toll (Thoits 1995). Numerous studies have shown that exposure to intense and ostensibly stressful life events (such as divorce or death of a close family member) is associated with higher levels of *psychological* problems including psychological distress, psychiatric disorders, substance abuse, and suicide (Dohrenwend 2000; Feskanich et al. 2002; Thoits 1995; Turner and Lloyd 1999). Exposure to chronic stressors (such as relationship and family problems, financial stress, and job strain) in addition to negative life events has also been linked with psychological distress or disorder, including depression (Bush 1999; Cui and Vaillant 1996; McGonagle and Kessler 1990; Pearlin 1989; Turner, Wheaton, and Lloyd 1995).

Epidemiological studies also have linked stress and major life events with a number of *physical health* outcomes, including mortality (Maddock and Pariante 2001; Matthews and Gump 2002; Thoits 1995). For example, stress has been found to increase the risk of such physical health outcomes as low birth weight, reactivation of latent viruses such as Epstein Barr and herpes simplex, and the incidence of other infectious diseases (Cohen and Williamson 1991; McKinnon et al. 1989; Sable and Wilkinson 2000). In their review of the literature, Greenwood and colleagues (1996) concluded that both life stress and a lack of social support significantly affect coronary heart disease incidence and mortality. Carroll and colleagues (2002:1439) reported that the risk of hospital admission for myocardial infarction increased by 25 percent the day of and the two days after England lost to Argentina in a World Cup soccer match that ended in a penalty shoot out, concluding that "myocardial infarction can be triggered by emotional upset, such as watching your football team lose an important match."

Socioeconomic Position and Stress

Pearlin (1989) has argued that most sources of stress are social in origin, since both chronic and acute experiences with stress and negative life events arise out of social roles, which themselves are the result of social stratification by social class, race, gender, and age.

As such, stress may contribute to socioeconomic disparities in health through multiple mechanisms (Baum et al. 1999; Evans, Barer, and Marmor 1994; McEwen 2001; Wilkinson 1999). Although almost everyone experiences some stress from personal relationships, work-related situations, or financial crises, people with limited economic resources or social disadvantage appear to face a greater amount of stress over the life course (Taylor and Seeman 1999; Thoits 1995). Thus, due to *differential exposure* to stressors, adverse biological effects of chronic stress should cumulate more among those of lower socioeconomic status.

Baum and colleagues' review of the literature (1999) concluded that socioeconomic position is associated with both the frequency of stressful life events and stress responses. They also suggested that many social environment features commonly perceived as stressful, such as crime, inadequate neighborhood services, transportation problems, discrimination based on race/ethnicity or social class, are significantly more prevalent in lower socioeconomic environments. Turner and colleagues' examination of the social distribution of stress (1995) similarly found that exposure to stress was strongly patterned by sociodemographic characteristics, with differential exposure explaining a substantial amount of the variation in depressive symptoms and major depressive disorder by gender, marital status, and occupational status. More recently, Grzywacz and colleagues (2004) found in cross-sectional analysis of diary information from the National Study of Daily Experiences that adults with low levels of education reported fewer stressors but more severe ones. However, the lower levels of physical symptoms and psychological distress observed among the better educated were not explained either by differential exposure or vulnerability to stress.

While the hypothesis that stress likely plays a role in socioeconomic inequalities in health has been put forth by a number of researchers, the empirical work conducted to date is quite limited (Macleod et al. 2001). Many of these studies were cross-sectional rather than longitudinal in nature, and they focused on depressive symptoms or other psychological outcomes rather than physical health. In addition, very few studies have explicitly examined the role of stressors in understanding socioeconomic disparities in health. There is some literature on the role of stress in explaining socioeconomic disparities in mental health (e.g., Turner et al. 1995) and in explaining racial differences in specific diseases or health conditions, such as hypertension (Turner et al. 1995; Williams et al. 1997). Nonetheless, the notion that differential exposure to stress may account for some portion of socioeconomic disparities in physical health is largely hypothetical and supported primarily by covariation at the present time (Baum et al. 1999).

This article seeks to bring additional insight to this topic by investigating the role of chronic stress and major negative life events as predictors of physical health and explanations for socioeconomic disparities in physical health using a longitudinal sample that includes both men and women. Our analysis attempts to answer three research questions related to the differential exposure hypothesis: (1) are measures of chronic stress and life events patterned by education and income? (2) are chronic stress and/or life events predictive of physical health outcomes over a 7.5 year time period? and (3) to what extent does differential exposure to chronic stress and life events serve as a mediator between education or income and health status? Issues of differential vulnerability to stress by education were beyond the scope of this article, but we plan to address them in future papers.

METHODS

The data come from the Americans' Changing Lives survey, a stratified, multistage area probability sample of noninstitutionalized adults age 25 and older living in the coterminous United States, with oversampling of both adults age 60 and older and African Americans. The wave 1 survey was conducted in 1986, with face-to-face interviews with 3,617 respondents (representing 70% of sampled households and 68% of sample individuals). Wave 2, also involving face-to-face interviews, was conducted in 1989 with 2,867 (83%) of wave 1 survivors. In 1994, approximately 7.5 years after baseline, wave 3 was conducted via telephone or face-to-face interviews with 2,562 participants or their proxies (representing 83% of wave 1 survivors). Data collection for wave 4 was in progress at the time the analysis presented in this article was conducted. Additional information on the study design is published elsewhere (House et al. 1994; House et al. 1990).

Information on demographic control vari-

ables, socioeconomic status, and baseline health status was obtained from wave 1. Information on five different measures of stress (described below) was obtained at both wave 1 and wave 2. Data on subsequent health status was taken from the 1994 wave 3 survey and ongoing mortality tracking. The result is a prospective study design in which baseline demographic and stress measures were ascertained in 1986, stress was again measured in 1989, and participants were followed into the future to determine the impact of stress measures on subsequent physical health status.

Demographic and Socioeconomic Measures

Demographic control variables, all taken from the wave 1 baseline survey, include sex (male vs. female), race (white vs. nonwhite), and age (based on self-reports and categorized as 25–34, 35–44, 45–54, 55–64, 65–74, and 75 or older). Socioeconomic position was measured with two variables: (1) education, measured as total years of completed education, and categorized as 0–11, 12–15, or 16 or more years; and (2) income, measured as the combined income in the preceding year from all sources for respondents and their spouses and grouped into three categories: $0–$9,999, $10,000–$29,999, and $30,000 or more. Using more refined categories of education and income did not significantly change the results.

Measures of Chronic Stress and Life Events

This analysis considers five self-reported measures of chronic stress and negative life events, measured at waves 1 and 2: (1) financial stress, (2) parental stress, (3) marital/domestic relationship stress, (4) the number of major negative events in one's lifetime, and (5) the number of major negative events in the past three years. The measures reflect the state of the art at the time of wave 1 (1986) and accord well with current standards of measurement of life events that recommend assessment of both recent negative life events and lifetime occurrence of more major/traumatic events (Turner 2001). More extensive measures of chronic stress have been developed since 1986 (e.g., Wheaton 1997), although there is no gold standard in this area as of yet. The study assessed four prominent domains or types of chronic stress—financial, marital, parental, and occupational—and used adaptations of the best measures available at that time in each domain, including Pearlin and Schooler's index of financial strain (1978) and Karasek and Theorell's approach to occupational stress (1990). There are not measures of chronic marital and parental stress as widely accepted as those for financial strain, but the measures we used clearly tap distress in these domains, have reasonable reliability, and relate to socioeconomic status and health in our analyses in ways that support their construct validity. Furthermore, the use of these measures at two points in time provides a better handle on the chronicity of stress than a one-time measurement.

The *financial chronic stress* scale comprised responses to three questions: (1) "How satisfied are you with your/your family's present financial situation?" (5-point response scale with 1 = completely satisfied and 5 = not satisfied at all); (2) "How difficult is it for you/your family to meet monthly payments on your bills?" (5-point response scale with 1 = extremely difficult and 5 = not difficult at all); and (3) "In general, how do your (family's) finances usually work out at the end of the month?" (1 = some money left over, 2 = just enough money, and 3 = not enough money). Responses to each item were standardized (with a mean of zero and standard deviation of one) and then averaged to create a scale with all items given equal weight. The resulting scale was then standardized to have a mean of zero and standard deviation of one for the total 1986 sample (Cronbach's alpha = .81).

A *parental chronic stress* scale was created from responses to three questions: (1) "At this point in your life, how satisfied are you with being a parent?" (5-point response scale with 1 = completely satisfied and 5 = not satisfied at all); (2) "How often do you feel bothered or upset as a parent?" (1 = almost always, 2 = often, 3 = sometimes, 4 = rarely, and 5 = never); and (3) "How happy are you with the way your child/children have turned out to this point?" (1 = very happy, 2 = quite happy, 3 = somewhat happy, 4 = not too happy, 5 = not at all happy). Items for this scale were also standardized to create a scale with mean zero and standard deviation of one (Cronbach's alpha = .61). For multivariate analysis, the parental chronic stress scale was recomputed such that those respondents without children would have a value of zero on the scale (rather than have a missing

value for this variable), adding a constant value (.01 plus the lowest score on the standardized value of the scale) to everyone's score so that the lowest value for those without children became zero and the stress scores of those with children ranged upward from .01. In multivariate analyses using the revised parental stress variable, a dummy variable indicating whether or not the respondent had any children was also included. The interpretation of this dummy variable is the effect of being a parent in the absence of any reported parental stress, and the parental stress variable reflects the impact of stress among those with children.

A *marital stress* scale measuring stress in intimate partner relationships was created for those who were married or reported living with a partner for six months or more. The scale comprised the responses to five statements or questions: (1) "My spouse/partner doesn't treat me as well as I deserve" (1 = agree strongly, 2 = agree somewhat, 3 = disagree somewhat, 4 = disagree strongly); (2) "I sometimes think of divorcing or separating from my spouse/partner" (same response categories); (3) "There are things in my marriage/relationship that I can never forgive" (same response categories); (4) "How often do you have unpleasant disagreements with your spouse/partner?" (1 = daily or almost daily; 2 = 2 or 3 times a week; 3 = about once a week; 4 = 2–3 times a month; 5 = about once a month; 6 = less than once a month; 7 = never); and (5) "How often do you feel bothered or upset by your relationship?" (1 = almost always; 2 = often; 3 = sometimes; 4 = rarely; 5 = never). Items for this scale were recoded and averaged, as described above, to create a scale with a mean of zero and standard deviation of one (Cronbach's alpha = .74). Like the parental stress scale, the marital stress scale was recomputed such that respondents who were not married or living with an intimate partner would have a value of zero on the scale, with a dummy variable indicating whether or not the respondent was married/living with a partner included in all regression analyses.

Regarding *negative lifetime events,* respondents were asked if they had ever been widowed, divorced (or had a marriage annulled), had a child die, or been the victim of a serious physical attack or assault at any time in their life. These four dichotomous variables were summed into a count of the number of negative lifetime events (ranging from 0 to 4). Information on the timing of these four events plus five others was used to create a separate (and potentially overlapping) count of the number of recent negative life events the respondent had experienced in the past three years (ranging from 0 to 9). The five other life events in the recent events count were (1) death of a parent/step parent, (2) death of a close friend/other relative, (3) involuntarily losing a job other than for retirement, (4) being robbed or burglarized, or (5) having anything else bad happen that upset the respondent a great deal. In multivariate regression analysis including both the lifetime and recent event counts, the recent event count estimates only the effects of the nonoverlapping recent events.

Information regarding stressors related to health was also available in the data (e.g., experiencing a serious or life-threatening illness in the past three years), but not used in these analyses because the dependent variables were all health related. Information on different dimensions of job-related stress was included in initial analyses, but the results were not significant, perhaps due to some weaknesses in the available measures (e.g., small number of items with low reliabilities), and hence are not considered further.

Health Status Measures

Three measures of physical health status were used in the analysis: mortality, functional health, and self-rated health. Mortality information from baseline (1986) through mid-1994 (the time of the wave 3 survey) was obtained from informants and the National Death Index. Deaths were verified with death certificates in over 96 percent of cases. Remaining reported deaths were determined to be actual deaths based on careful review of information from reliable informants or other sources. Respondents' health status was assessed via self-reports at baseline and prospectively 7.5 years later (1994). Information from several questions in the surveys was used to score respondents' functional health, where a low score of 1 represents confinement to a bed or chair and a score of 4 represents the ability to do heavy work inside or outside of the home. These scores were then transformed into a three-category variable: (1) no functional limitation (i.e., able to do heavy work around the house); (2) some limitation, meaning respondent reported not being able to do such things

as heavy physical labor or work around the house; or (3) moderate/severe limitation, meaning the respondent reported having great difficulty walking a few blocks or climbing stairs, or reported being confined to a bed or a chair. Respondents also were asked to classify their self-rated health as being excellent, very good, good, fair, or poor. We collapsed this five-category scale into three categories: (1) excellent/very good; (2) good; (3) fair/poor. Self-rated health has been shown to have high test-retest reliability, and to be quite predictive of mortality and other health outcomes (Lundberg and Manderbacka 1996; Idler and Benyamini 1997).

Statistical Analysis

For the *mortality* analysis, all independent variables were taken from wave 1 and used to predict mortality between wave 1 and wave 3 (7.5 years). For the *health status* analysis, independent variables were taken from wave 1 (sociodemographic variables, baseline health status, and the five stress measures) and wave 2 (four stress measures) and used to predict the three health-related dependent variables (mortality, functional health, and self-rated health) at wave 3. Data were weighted in all analyses to adjust for differential response rates and the sampling design. Poststratification weights adjust the wave 1 sample results to U.S. Bureau of the Census population estimates by sex, age, and region of the country for July 1, 1986.

Cox proportional hazard models were used to estimate the relative hazard of mortality during the follow-up period as a function of demographic, socioeconomic, and stress variables. A series of multiple predictor models was estimated, with all models controlling for age, sex, race, and health status at baseline. In model 1, the relative hazard rate of mortality over the follow-up period was estimated for income and education. In model 2, the relative hazard rate of mortality was estimated for wave 1 stress and life events variables under study, controlling for socioeconomic position. In model 3, wave 2 stress/life events variables were added to model 2, in an attempt to investigate the degree to which stress/life event variables at both waves 1 and 2 predict mortality by wave 3 and attenuate the effects of income and education observed in model 1. In model 3, a dummy variable indicating no information at wave 2 (due to mortality or survey nonresponse) was included so these study subjects would not be dropped from analysis due to missing data.

In our health status analyses, multinomial logistic regression was used to estimate the relative risk of specific health status outcomes at wave 3 as a function of prior measures of demographic, socioeconomic, and stress variables. For analyses regarding functional health, the outcome variable had five possible values: (1) no functional limitation (the referent category); (2) some limitation; (3) moderate/severe limitation; (4) mortality between wave 1 and wave 3 (n = 542); and (5) survey nonresponse at wave 3 (n = 513). For analyses regarding self-rated health, the outcome variable also had five possible values: (1) excellent/very good self-rated health (the referent category); (2) good health; (3) fair/poor health; (4) mortality between wave 1 and wave 3; and (5) survey nonresponse at wave 3.These models predicted the relative risk of being in a specific health status category at wave 3, having died, or not participating in the wave 3 survey compared with being in the best or optimum health category (i.e., no functional limitation or excellent/very good health).

For analyses regarding functional limitation and self-rated health, a series of three multiple predictor models was estimated. Model 1 investigated the effects of income and education on health status outcomes; model 2 added stress and life/event variables from wave 1; and model 3 added stress/life event variables from wave 2 (and a dummy variable for no information at wave 2 due to mortality or survey nonresponse). All models controlled for age, sex, race, and baseline health status. Since the models controlled for baseline health, our analyses served to identify predictors of change to a negative health status between waves 1 and 3, relative to those who stayed in the best health category.

The multinomial models described above controlled for mortality and survey nonresponse (n = 3,617). In combination with weighting for nonresponse, these analyses help to adjust for panel attrition in the sample. We also conducted another series of multinomial logistic regression analyses to investigate predictors of wave 3 health status using those respondents who were alive and responded to all three waves of the survey (n = 2,348). In removing those who died or were nonresponders at wave 2 or wave 3, we are investigating the impact of socioeconomic and stress measures over time on a subgroup of respondents who survived the entire

follow-up period and who contributed information regarding stress variables at two points in time.

RESULTS

A significant portion of the sample at wave 1 was classified as socioeconomically disadvantaged (Table 1). In addition, 61 percent of the sample had experienced one or more life events in the past three years, and 47.8 percent of the sample had ever experienced at least one of four major life events being considered (with 11.8% widowed, 24.5% divorced, 11.3% had a child die, and 16.6% were the victim of a serious physical assault).

At baseline, 15.3 percent of the sample was classified as having some or a moderate/severe level of functional limitation, and 15.2 percent reported that they were in fair or poor health (Table 1). Between wave 1 and wave 3, 9.8 percent of subjects died, and 12.7 percent did not participate in the wave 3 survey. In addition to these two outcomes, 64.7 percent reported the same level of functional health between wave 1 and wave 3, 9.1 percent experienced a decline in functional health, and 3.7 percent experienced an improvement. Regarding self-rated health status, 50.0 percent reported the same level of health, 18.8 percent reported a decline in health, and 8.7 percent reported improved health between waves 1 and 3.

Given the strong associations among income, education, and age in the sample, we present results regarding the income and education differences in the prevalence of stress or life event variables at wave 1 stratified by age (Tables 2–4). The distributions of the majority of the stress and life event variables were significantly related to both education and income, for the study sample as a whole and within three different age groups (25–44 years, 45–64 years, and 65 years and older).

There was a generally monotonic, inverse relationship between the prevalence of chronic stress/negative life events and socioeconomic position, with those in the lowest education and income categories reporting the highest prevalence at wave 1 (Tables 2–4). For example, across all age groups, those in the lowest education and income categories had significantly higher rates of financial chronic stress ($p < .001$), and there was a significant inverse relationship between the number of negative lifetime events and income and education levels. The individual events that make up the lifetime event count (Tables 2–4) provide further evidence of a relationship between socioeconomic position and the experience of negative life events. For example, of those ages 45–64 years with less than 12 years of schooling, 16.2 percent had ever been widowed, 30.1 percent had been divorced, and

TABLE 1. Weighted Percents and Means of Study Variables

Variable	Weighted Percent or Mean
Age in years (%)	
25–44	52.2
45–64	28.3
65+	19.5
Race (%)	
Nonblack	89.0
Black	11.0
Education in years (%)	
0–11	25.6
12–15	54.7
16+	19.7
Annual household income in dollars (%)	
<10,000	19.2
10,000–29,999	40.5
30,000+	40.3
Marital stress scale	
Mean	.0
Range	−1.48–4.10
Parental stress scale	
Mean	.0
Range	−1.58–4.65
Financial stress scale	
Mean	.0
Range	−1.50–2.79
Number of life events in past 3 years	
0 (%)	39.0
1 (%)	40.0
2 (%)	16.3
3+ (%)	4.7
Mean	.88
Number of 4 major lifetime events	
0 (%)	52.2
1 (%)	33.7
2 (%)	11.9
3 or 4 (%)	2.2
Mean	.64
Ever widowed (%)	11.8
Ever divorced (%)	24.5
Ever had child die (%)	11.3
Ever assaulted (%)	16.6
Functional health, wave 1 (%)	
No limitation	84.7
Some limitation	6.8
Moderate/severe limitation	8.5
Self-rated health, wave 1 (%)	
Excellent/very good	64.2
Good	20.6
Fair/poor	15.2

Note: n = 3,617.

TABLE 2. Wave 1 Stress/Life Event Variables by Socioeconomic Indicators, Ages 25–44 Years

	Education (in years)				Income (in dollars)			
Variable	<12	12–15	>15	*p*-value	<10K	10K–29K	30K+	*p*-value
Mean, marital stress scale	.29	.17	–.03	<.05	.31	.22	.06	.05
Mean, parental stress scale	.18	.10	–.05	<.05	.11	.15	.03	.12
Mean, financial stress scale	.61	.15	–.04	<.001	1.12	.35	–.24	<.001
Mean number of events past 3 years	1.09	.92	.87	<.05	1.11	1.02	.81	<.001
Mean number of lifetime events	.76	.53	.33	<.001	.61	.57	.44	<.001
Ever widowed (%)	2.5	1.3	.8	.16	5.3	1.0	.5	<.001
Ever divorced (%)	31.6	28.4	13.3	<.001	25.0	28.5	22.1	.01
Ever had child die (%)	11.3	5.0	1.4	<.001	6.1	5.6	4.2	.28
Ever assaulted (%)	31.1	18.8	17.1	<.001	25.0	22.0	17.0	.005

TABLE 3. Wave 1 Stress/Life Event Variables by Socioeconomic Indicators, Ages 45–64 Years

	Education (in years)				Income (in dollars)			
Variable	<12	12–15	>15	*p*-value	<10K	10K–29K	30K+	*p*-value
Mean, marital stress scale	–.13	–.08	.18	<.05	–.12	–.11	.01	.25
Mean, parental stress scale	.06	.12	.24	..25	.05	.12	.14	.61
Mean, financial stress scale	.17	–.16	–.25	<.001	.50	.09	–.43	<.001
Mean number of events past 3 years	.92	.79	.86	.10	1.03	.86	.75	<.001
Mean number of lifetime events	.84	.68	.55	<.001	1.11	.71	.56	<.001
Ever widowed (%)	16.2	9.9	6.4	.002	28.0	11.8	4.3	<.001
Ever divorced (%)	30.1	30.0	25.6	.56	36.6	30.0	25.4	.02
Ever had child die (%)	23.2	13.2	6.5	<.001	26.6	16.2	9.8	<.001
Ever assaulted (%)	15.0	15.6	16.3	.94	20.1	13.0	16.1	.09

TABLE 4. Wave 1 Stress/Life Event Variables by Socioeconomic Indicators, Ages 65 Years and Older

	Education (in years)				Income (in dollars)			
Variable	<12	12–15	>15	*p*-value	<10K	10K–29K	30K+	*p*-value
Mean, marital stress scale	–.33	–.41	–.29	.44	–.25	–.43	–.29	.08
Mean, parental stress scale	–.43	–.35	–.30	.29	–.42	–.38	–.32	.56
Mean, financial stress scale	–.13	–.54	–.56	<.001	.03	–.50	–.85	<.001
Mean number of events past 3 years	.71	.88	.78	<.001	.74	.83	.74	.11
Mean number of lifetime events	1.0	.77	.82	<.001	1.07	.83	.59	<.001
Ever widowed (%)	43.9	37.4	38.0	.22	54.7	35.7	17.6	<.001
Ever divorced (%)	19.4	14.4	11.1	.10	18.7	17.3	8.5	.06
Ever had child die (%)	29.7	13.9	22.1	<.001	27.3	20.6	16.3	.04
Ever assaulted (%)	7.1	11.3	10.4	.18	6.5	9.1	16.4	.01

23.2 percent had experienced the death of a child, compared with the highest education group in which 6.4 percent had been widowed, 25.6 percent had been divorced, and 6.5 percent had experienced the death of a child (Table 3).

Additional analysis (of the subsample of people responding to all three waves, n = 2,348) revealed that a significant proportion of people scoring high on stress measures at wave 1 reported similarly high scores at wave 2. For example, of those scoring in the top quartile of the financial chronic stress scale at wave 1, 80 percent were also in the top quartile at wave 2; of those scoring in the top quartile for both parental and marital stress at wave 1, 58 percent were in the top quartile for these variables at wave 2.

Mortality Results

Cox proportional hazard analyses demonstrated that income (net of education) was significantly related to mortality during the 7.5-year follow-up period of the Americans' Changing Lives study (Table 5). Compared to those in the highest income category, the hazard rate ratio of dying during the follow-up period was more than two times greater for those in the middle-income group (hazard rate ratio =

TABLE 5. Coefficients and Mortality Hazard Rate Ratios from Cox Proportional Hazard Models

	Model 1		Model 2		Model 3	
Independent Variables	Coefficient	Hazard Rate Ratio (95% C.I.)	Coefficient	Hazard Rate Ratio (95% C.I.)	Coefficient	Hazard Rate Ratio (95% C.I.)
Female	−.90***	0.41 (.31–.54)	−.97***	0.38 (.29–.50)	−.92***	0.40 (.30–.53)
White	−.32*	0.73 (.57–.93)	−.24	0.79 (.61–1.01)	−.27	0.76 (.58–1.00)
Education 0–11 years	.08	1.09 (.72–1.63)	.13	1.14 (.74,1.76)	.19	1.21 (.82–1.79)
Education 12–15 years	−.02	0.98 (.65–1.47)	.02	1.02 (.67–1.54)	.00	1.00 (.66–1.49)
Income < $10,000	1.02***	2.78 (1.72–4.48)	.84***	2.31 (1.50–3.58)	.69**	1.98 (1.28–3.09)
Income $10,000–$29,999	.80**	2.20 (1.37–3.51)	.79**	2.01 (1.29–3.13)	.57*	1.78 (1.12–2.80)
Stress/life event variables						
W1 parent dummy			−.04	0.96 (.66–1.40)	.10	1.11 (.71–1.74)
W1 parental stress			.00	1.00 (.84–1.18)	.03	1.03 (.88–1.20)
W1 financial stress			.08	1.09 (.92–1.29)	.12	1.12 (.94–1.33)
W1 partner dummy			−.13	0.87 (.63–1.21)	−.32	0.72 (.46–1.15)
W1 marital stress			.01	1.01 (.82–1.25)	.00	1.00 (.80–1.26)
W1 recent life events			−.05	0.95 (.78–1.16)	−.01	0.99 (.81–1.21)
W1 lifetime events			.23**	1.26 (1.10–1.44)	.22**	1.25 (1.06–1.47)
W2 parent dummy					−.40	0.67 (.39–1.17)
W2 parental stress					−.06	0.94 (.79–1.12)
W2 financial stress					−.01	0.99 (.81–1.22)
W2 partner dummy					.19	1.21 (.72–2.06)
W2 marital stress					.06	1.06 (.80–1.40)
W2 recent life events					−.01	1.07 (.86–1.32)

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

Notes: n = 3,617. W1 = wave 1; W2 = wave 2. Models control for age and baseline health status. Referent groups are male, nonwhite, education > 16 years, and income > $29,999. C.I. = confidence interval.

2.20, 95% confidence interval 1.37–3.51) and nearly three times greater for those in the lowest income group (hazard rate ratio = 2.78, 95% confidence interval 1.72–4.48) (Table 5, model 1).

Mortality analyses also revealed that the number of negative lifetime events was significantly related to mortality when controlling for age, race, sex, wave 1 health status, education and income (hazard rate ratio = 1.26, 95% confidence interval 1.10–1.44) (Table 5, model 2). The effects of this variable remained the same in a model with wave 2 stress variables (Table 5, model 3). When considering the effects of the four individual variables that make up the life event scale in a full model, the results suggested that having been a victim of a physical assault was the only single item predictive of subsequent mortality (hazard rate ratio = 1.51, 95% confidence interval 1.1–2.1). To see if this effect was driving the observed effect of the lifetime event count variable on mortality, we revised the count variable to exclude being a victim of a physical assault. The effect of the

revised variable remained significantly predictive of mortality without including physical assault in the count (hazard rate ratio = 1.17, 95% confidence interval 1.01–1.37).

Although the wave 1 life event count was the only stress or life event variable significantly predictive of mortality in the models analyzed, considering these psychosocial variables at both wave 1 and wave 2 did attenuate the effect of income on mortality (Table 5, models 1–3). In addition, when stress and life event variables were added to the base model with sociodemographics, the effect of race, which showed a significantly lower mortality rate for whites in model 1, attenuated to just above statistical significance at the .05 level (Table 5, models 1–3).

Functional Health

In contrast to the mortality analysis, both education and, to a lesser degree, income were significant predictors of some level of functional limitation at wave 3 (Table 6, model 1). Those in the lowest education and income groups were significantly more likely to report severe or moderate functional limitation at wave 3, controlling for baseline health status.

In a model controlling for baseline income, education, and health status (along with age, sex, and race), wave 1 financial chronic stress and the wave 1 count of lifetime events were predictive of severe or moderate limitation at wave 3 (Table 6, model 2). When stress variables measured at wave 2 were added to the model, wave 2 financial chronic stress was significantly predictive of severe or moderate limitation at wave 3, with the effects of wave 1 stress measures attenuating to insignificance (Table 6, model 3). Thus, it appears that financial stress decreases physical functioning in this longitudinal sample, but it is the more proximate measure of financial stress that drives the effect.

In addition, when comparing the effects of income and education on functional limitation in models with and without the stress or life event variables, the results show that there was some attenuation in the effects of race, income, and education on physical functioning at wave 3 when stress measures were considered (Table 6, models 1 and 3). Although the effects

TABLE 6. Coefficients from Multinomial Logistic Regressions Predicting Functional Health at Wave 3

	Model 1		Model 2		Model 3	
Independent Variables	Severe/Moderate Limitation	Some Limitation	Severe/Moderate Limitation	Some Limitation	Severe/Moderate Limitation	Some Limitation
Female	.06	.76***	.04	.74***	.10	.76***
White	–.55**	–.35	–.54**	–.37	–.44*	–.33
Education < 12 years	1.06***	.45	.96***	.50	.82**	.43
Education 12–15 years	.54*	.17	.46	.19	.43	.16
Income < $10,000	.72***	.01	.54*	–.15	.45	–.20
Income $10,000–$29,999	.31	–.19	.20	–.25	.18	–.25
Stress/life event variables						
W1 parent dummy			.51	–.33	.70	–.62
W1 parental stress			.01	.15	–.05	.14
W1 financial stress			.19*	–.08	.07	–.17
W1 partner dummy			.00	–.35	.33	–.49
W1 marital stress			.05	.02	.02	.02
W1 recent life events			.15	–.01	.14	–.03
W1 lifetime events			.20*	.13	.20	.12
W2 parent dummy					–.30	.32
W2 parental stress					.13	.03
W2 financial stress					.24**	.18
W2 partner dummy					–.49	.20
W2 marital stress					.02	–.04
W2 recent life events					–.04	–.04

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

Notes: n = 3,617. W1 = wave 1; W2 = wave 2. Models control for age and baseline health status. Referent groups are male, nonwhite, education > 16 years, and income > $29,999. Comparisons are being made to those with no functional limitations.

of being in the lowest education group on severe or moderate functional limitation remained significant in the full model, the effects of low income on functional limitation at wave 3 attenuated to insignificance. The results suggest, not surprisingly, that the effects of low income on functional limitation are mediated in part by stress effects from financial difficulties.

Self-Rated Health

As with functional health, both education and income were significant predictors of lower levels of self-rated health at wave 3 (Table 7, model 1). Low educational attainment (<12 years) was significantly predictive of both fair or poor health and good health, while low income was predictive of fair or poor health. In addition, white respondents were significantly less likely to report lower levels of health at wave 3 than nonwhites.

Wave 1 marital stress was significantly associated with being in fair or poor self-rated health at wave 3 among people with spouses or partners (Table 7, model 2). The results also suggest that being partnered was protective against a lower level of self-rated health at wave 3. When wave 2 stress and life event variables were added to the model, the effect of wave 1 marital stress was no longer significantly predictive of fair or poor health at wave 3. However, both parental stress and financial stress measured at wave 2 were significantly related to fair or poor health at wave 3. Thus, in the case of self-rated health, the more proximate measures of financial stress and parental stress (from wave 2) were significantly related to being in fair or poor health at wave 3.

In the full model (Table 7, model 3), the effects of income and education remained significantly predictive of self-rated health at wave 3. Adding controls for major stress and negative life event variables produced minor changes in the income and education coefficients. Thus, it does not appear that the stress or life event variables considered in the Americans' Changing Lives study explain much of the strong prospective relationship between socioeconomic position and self-rated health. In addition, the effects of race on self-rated health attenuated slightly yet remained significant in the full model, with white respondents less likely to report lower levels of self-rated health.

Other Analyses

The analyses described above for functional impairment and self-rated health were repeated using the subsample of respondents who participated in all three waves (n = 2,348). The results of these analyses (not shown) are quite similar to those reported above for the full sample, with some important exceptions. In regard to functional health, the wave 1 lifetime event measure was significantly and positively associated with severe or moderate impairment at wave 3 (an effect not observed in the full sample). As in the full sample, the effects of education and income attenuated when the wave 1 and wave 2 stress variables were added to the model. In the subsample, however, the income effect attenuated to a greater degree and became insignificant. This suggests that, in this subsample of survivors with complete information, the negative effect of low income on functional health over time may be primarily understood by its association with stress and life event variables. In regard to self-rated health, the results for the subsample were very similar to those for the full sample.

DISCUSSION

Our results add to growing evidence that low income and limited educational attainment are strongly predictive of health status and health decline over time. The results also suggest significant socioeconomic disparities in the major life events and chronic stressors considered in this study, and that some of these variables are predictive of mortality and health over time. This includes the findings that a count of negative lifetime events was positively associated with the risk of mortality, and that a higher score on a financial stress scale was predictive of having moderate or severe functional impairment and a report of fair or poor health at wave 3. Income, but not education, was predictive of mortality, and remained so, though at a lower level, when financial stress is added to the model. In the case of functional health, the effects of education and race remained significantly predictive of severe or moderate limitation when stress and life event measures were considered, while the effects of low income attenuated to insignificance. In the case of self-rated health, income, education, and race all remained significantly predictive of lower levels

TABLE 7. Coefficients from Multinomial Logistic Regressions Predicting Self-Rated Health at Wave 3

	Model 1		Model 2		Model 3	
Independent Variables	Fair/Poor SRH	Good SRH	Fair/Poor SRH	Good SRH	Fair/Poor SRH	Good SRH
Female	–.12	.09	–.14	.10	–.10	.12
White	–.51**	–.09	–.47**	–.08	–.38*	–.04
Education < 12 years	1.01***	.50**	1.05***	.49**	.97***	.45**
Education 12–15 years	.39*	.20	.40*	.19	.43*	.19
Income < $10,000	.78***	.20	.72***	.22	.72**	.28
Income $10,000–$29,999	.23	–.01	.22	–.02	.22	.01
Stress/life event variables						
W1 parent dummy			–.18	–.30	.57	–.23
W1 parental stress			.02	.16**	–.11	.11
W1 financial stress			.04	–.01	–.10	–.11
W1 partner dummy			–.46*	–.07	–.57*	–.51*
W1 marital stress			.27***	.08	.17	.04
W1 recent life events			.00	–.03	–.01	–.05
W1 lifetime events			–.02	.09	–.01	.09
W2 parent dummy					–.98**	–.09
W2 parental stress					.19*	.06
W2 financial stress					.33***	.18**
W2 partner dummy					.20	–.64***
W2 marital stress					.16	.08
W2 recent life events					–.08	.06

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

Notes: n = 3,617. W1 = wave 1; W2 = wave 2. SRH = self-rated health. Models control for age and baseline health status. Referent groups are male, nonwhite, education > 16 years, and income > $29,999. Comparisons are being made to those with excellent/very good self-rated health.

of health over time, even when controlling for stress and life event factors.

Our results suggest several important conclusions. First, there is indeed differential exposure by socioeconomic position to negative life events and other types of stressors. Second, some types of stress and life events are predictive of general physical health outcomes, with the more proximate measures of stress generally more powerful in terms of predicting subsequent health status outcomes. Third, stress and negative life events may be a more salient mechanism by which socioeconomic differentials in mortality and functional limitation are produced than differentials in self-rated health. Consideration of stress and life event variables attenuated the socioeconomic differences in mortality and functional limitation in our sample, but they had only a very minor effect on socioeconomic differences in self-rated health. The reasons that stressors do not appear to mediate socioeconomic effects on self-rated health are not clear, but perhaps part of the explanation is that this is a very general or global measure of health status that is not well-suited for capturing the effects of stress on health.

Our findings should be qualified in a number of ways. First, mental health outcomes were not considered in this study. Second, the number of life event and stress variables considered was limited to the major ones that are experienced by people across social strata (Cohen et al. 1995). The literature indicates that a full evaluation of the impact of stress requires a comprehensive assessment of stress, since the association between stress and health status is generally stronger when multiple domains of stress are included (Taylor and Seeman 1999; Thoits 1995; Turner et al. 1995). Third, it should be acknowledged that some of our measures of stress (e.g., ever divorced or ever widowed) could precede and therefore be causes rather than consequences of baseline income and education.

Fourth, our approach focused on a direct relationship between environmental demand and physical health outcomes, neglecting the importance of psychological factors (such as vulnerability, coping, and adaptive responses) in the process. For example, Turner and Avison (1992) argue that only unsuccessfully resolved life events should be used in counts to achieve a better estimate of the true burden of these events.

In this research, however, we investigated the incidence of different types of life events without taking into account whether a subject was able to deal or cope with them successfully.

Despite our inability to investigate many of the nuances in the relationship between stress and health, our findings offer support for the hypothesis that increased exposure to the myriad stressors experienced by those of lower social position takes a physical toll and thus contributes in part to social inequalities in physical health. The research presented here has numerous strengths, including that the study design was prospective and the sample was nationally representative. The effects of a number of different measures of chronic stress and life events (both recent and lifetime) were considered, using three different physical health outcomes. The results add to the literature by demonstrating that major types of stress and life events are strongly patterned by socioeconomic position, that some appear to be predictive of mortality and declines in general measures of physical health status over time, and that differential exposure explains some portion of socioeconomic disparities in health.

It is unlikely that researchers will ever identify one or even a small number of psychosocial factors that can explain the majority of the health inequalities observed across social strata. In prior research, we have shown that health behaviors also play only a modest role in explaining social disparities in mortality and health across education and income levels (Lantz et al. 1998, 2001). As a fundamental cause of health status (Link and Phelan 1995), socioeconomic position and race affect a large and changing array of individual, household, and environmental factors related to health. Thus, it is probable that while each of these factors can explain only a small amount of disparities in health, a large number of factors taken together can have great explanatory power (House et al. 1994.) Hence, chronic and acute life events and stress should continue to be considered an important part of a larger group of psychosocial factors that help us to understand socioeconomic disparities in mortality and health status.

REFERENCES

Adler, Nancy E. and Joan M. Ostrove. 1999. "Socioeconomic Status and Health: What We Know and What We Don't." *Annals of the New York Academy of Sciences* 896:3–15.

Baum, Andrew, J. P. Garofalo, and Ann Marie Yali. 1999. "Socioeconomic Status and Chronic Stress: Does Stress Account for SES Effects on Health?" *Annals of New York Academy of Sciences* 896:131–44.

Bush, B. A. 1999. "Major Life Events as Risk Factors for Post-stroke Depression." *Brain Injury* 13(2):131–37.

Carroll, Douglas, Shah Ebrahim, Kate Tilling, John Macleod, and George Davey Smith. 2002. "Admissions for Myocardial Infarction and World Cup Football: Database Survey." *British Medical Journal* 325:1439–42.

Cohen, Sheldon, Ronald C. Kessler, and Lynn U. Gordon. 1995. "Strategies for Measuring Stress in Studies of Psychiatric and Physical Disorders." In *Measuring Stress: A Guide for Health and Social Scientists*, edited by S. Cohen, R. C. Kessler, and L. U. Gordon. New York: Oxford University Press.

Cohen, Sheldon and Gail M. Williamson. 1991. "Stress and Infectious Disease in Humans." *Psychological Bulletin* 109:310–57.

Cui, Xing-Jai and George E. Vaillant. 1996. "Antecedents and Consequences of Negative Life Events in Adulthood: A Longitudinal Study." *American Journal of Psychiatry* 153(1):21–26.

Dohrenwend, Bruce P. 2000. "The Role of Adversity and Stress in Psychopathology: Some Evidence and Its Implications for Theory and Research." *Journal of Health and Social Behavior* 41(1):1–19.

Evans, Robert G., Morris L. Barer, and Theodore R. Marmor. 1994. *Why Are Some People Healthy and Others Not? The Determinants of Health of Populations.* New York: Aldine de Gruyter.

Feskanich, Diane, Janice L. Hastrup, J. R. Marshall, Graham Colditz, M. J. Stampfer, Walter C. Willett, and Ichiro Kawachi. 2002. "Stress and Suicide in the Nurses' Health Study." *Journal of Epidemiology and Community Health* 56(2):95–98.

Greenwood, D. C., K. R. Muir, C. J. Packham, and R. J. Madeley. 1996. "Coronary Heart Disease: A Review of the Role of Psychosocial Stress and Social Support." *Journal of Public Health Medicine* 18(2):221–31.

Grzywacz, J. G., David M. Almeida, Shevaun D. Neupert, and Susan L. Ettner. 2004. "Socioeconomic Status and Health: A Micro-level Analysis of Exposure and Vulnerability to Daily Stressors." *Journal of Health and Social Behavior* 45(1):1–16.

House, James S. 2002. "Understanding Social Factors and Inequalities in Health: 20th Century Progress and 21st Century Prospects." *Journal of Health and Social Behavior* 43(2):125–42.

House, James S., Ronald C. Kessler, and A. Regula Herzog. 1990. "Age, Socioeconomic Status, and Health." *Milbank Quarterly* 68(3):383–411.

House, James S., James M. Lepkowski, Anne M. Kinney, Richard P. Mero, Ronald C. Kessler, and A. Regula Herzog. 1994. "The Social Stratification of Aging and Health." *Journal of Health and Social Behavior* 35(3):213–34.

House, James S. and David R. Williams. 1995. "Psychosocial Pathways Linking SES and CVD." Pp. 119–24 in *National Institutes of Health, National Heart, Lung, and Blood Institute's Report of the Conference on Socioeconomic Status and Cardiovascular Health and Disease*. Hyattsville, MD: National Institutes of Health.

Idler, Ellen L. and Yael Benyamini. 1997. "Self-Rated Health and Mortality: A Review of Twenty-seven Community Studies." *Journal of Health and Social Behavior* 38(1):21–37.

Karasek, Robert and T. Theorell. 1990. *Healthy Work: Stress, Productivity, and the Reconstruction of Working Life*. New York: Basic.

Kelly, Shona, Clyde Hertzman, and Mark Daniels. 1997. "Searching for the Biological Pathways between Stress and Health." *Annual Review of Public Health* 18:437–62.

Lantz, Paula M., James S. House, James M. Lepkowski, David R. Williams, Richard P. Mero, and J. Chen. 1998. "Socioeconomic Factors, Health Behaviors, and Mortality: Results from a Nationally Representative Prospective Study of U.S. Adults." *Journal of the American Medical Association* 279:1703–8.

Lantz, Paula M., John W. Lynch, James S. House, James M. Lepkowski, Richard P. Mero, Marc A. Musick, and David R. Williams. 2001. "Socioeconomic Disparities in Health Change in a Longitudinal Study of U.S. Adults: The Role of Health-Risk Behaviors." *Social Science and Medicine* 53:29–40.

Link, Bruce and Jo Phelan. 1995. "Social Conditions as Fundamental Causes of Disease." *Journal of Health and Social Behavior* 36(extra issue):80–94.

Lundberg, O. and K. Manderbacka. 1996. "Assessing Reliability of a Measure of Self-Rated Health." *Scandinavian Journal of Social Medicine* 24(3):218–24.

Lynch, John W., George A. Kaplan, R. D. Cohen, J. Tuimilethto, and J. T. Salonen. 1996. "Do Cardiovascular Risk Factors Explain the Relation between Socioeconomic Status, Risk of All-Cause Mortality, Cardiovascular Mortality, and Acute Myocardial Infarction?" *American Journal of Epidemiology* 144:934–42.

Macleod, John, George Davey Smith, Pauline Heslop, Chris Metcalfe, Douglas Carroll, and Carole Hart. 2001. "Are the Effects of Psychosocial Exposures Attributable to Confounding? Evidence from a Prospective Observational Study on Psychological Stress and Mortality." *Journal of Epidemiology and Community Health* 55(12):878–84.

Maddock, C. and C. M. Pariante. 2001. "How Does Stress Effect You? An Overview of Stress, Immunity, Depression, and Disease." *Epidemiologia e Psychiatria Sociale* 10(3):153–62.

Marmot, Michael G. 1999. "Acting on the Evidence to Reduce Inequalities in Health." *Health Affairs* 18(3):42–44.

Marmot, Michael G., R. Fuhrer, S. L. Ettner, N. F. Marks, L. L. Bumpass, and C. D. Ryff. 1998. "Contribution of Psychosocial Factors to Socioeconomic Differences in Health." *Milbank Quarterly* 76(3):403–49.

Matthews, Karen A. and Brooks B. Gump. 2002. "Chronic Work Stress and Marital Dissolution Increase Risk of Posttrial Mortality in Men from the Multiple Risk Factor Intervention Trial." *Archives of Internal Medicine* 162(3):309–15.

McEwen, Bruce S. 2001. "From Molecules to Mind: Stress, Individual Differences, and the Social Environment." *Annals of the New York Academy of Sciences* 935:42–49.

McEwen, Bruce S. and Teresa Seeman. 1999. "Protective and Damaging Effects of Mediators of Stress: Elaborating and Testing the Concepts of Allostasis and Allostatic Load." *Annals of the New York Academy of Sciences* 896:30–47.

McGonagle, Katherine A. and Ronald C. Kessler. 1990. "Chronic Stress, Acute Stress, and Depressive Symptoms." *American Journal of Community Psychology* 18(5):681–706.

McKinnon, W., C. S. Weisse, C. P. Reynolds, C. A. Bowles, and A. Baum. 1989. "Chronic Stress, Leukocyte Subpopulations, and Humoral Response to Latent Viruses." *Health Psychology* 8:389–402.

Miller, T. Q., T. W. Smith, C. W. Turner, M. L. Guijarro, and A. J. Hallet. 1996. "A Meta-analytic Review of Research on Hostility and Physical Health." *Psychological Bulletin* 119:322–48.

Pearlin, Leonard I. 1989. "The Sociological Study of Stress." *Journal of Health and Social Behavior* 22:337–56.

Pearlin, Leonard I. and C. Schooler. 1978. "The Structure of Coping." *Journal of Health and Social Behavior* 19(1):2–21.

Sable, Marjorie R. and Deborah S. Wilkinson. 2000. "Impact of Perceived Stress, Major Life Events, and Pregnancy Attitudes on Low Birth Weight." *Family Planning Perspectives* 32(6):288–94.

Tarlov, Alvin R. 1999. "Public Policy Frameworks for Improving Population Health." *Annals of the New York Academy of Sciences* 896:281–93.

Taylor, Shelley E. and Teresa E. Seeman. 1999. "Psychosocial Resources and the SES-Health Relationship." *Annals of the New York Academy of Sciences* 896:210–25.

Thoits, Peggy A. 1995. "Stress, Coping, and Social Support Processes: Where Are We? What Next?" *Journal of Health and Social Behavior* 36(extra issue):53–79.

Turner, R. Jay. 2001. "Stress: Measurement by Self-Report and Interview." *International Encyclope-*

dia of the Social and Behavioral Sciences. London: Elsevier.

Turner, R. Jay and William R. Avison. 1992. "Innovations in the Measurement of Life Stress: Crisis Theory and the Significance of Event Resolution." *Journal of Health and Social Behavior* 33(1):36–50.

———. 2003. "Status Variations in Stress Exposure: Implications for the Interpretation of Research on Race, Socioeconomic Status, and Gender." *Journal of Health and Social Behavior* 44(4):488–505.

Turner, R. Jay and Donald A. Lloyd. 1999. "The Stress Process and the Social Distribution of Depression." *Journal of Health and Social Behavior* 40(4):374–404.

Turner, R. Jay, Blair Wheaton, and Donald A. Lloyd. 1995. "The Epidemiology of Social Stress." *American Sociological Review* 60(1):104–25.

Wheaton, Blair. 1997. "The Nature of Chronic Stress." In *Coping with Chronic Stress,* edited by Benjamin H. Gottleib. New York: Plenum.

Wilkinson, Richard G. 1999. "Health, Hierarchy, and Social Anxiety." *Annals of the New York Academy of Sciences* 896:48–63.

Williams, David R., Yan Yu, James S. Jackson, and Norman B. Anderson. 1997. "Racial Differences in Physical and Mental Health: Socio-economic Status, Stress, and Discrimination." *Journal of Health Psychology* 2:335–51.

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