



Published in final edited form as:

*Soc Sci Med.* 2010 July ; 71(2): 259–265. doi:10.1016/j.socscimed.2010.04.001.

## Life-course Financial Strain and Health in African-Americans

**Sarah L. Szanton,**

Johns Hopkins University, Baltimore, MD UNITED STATES, [sszanton@son.jhmi.edu](mailto:sszanton@son.jhmi.edu)

**Roland J Thorpe, PhD,** and

Johns Hopkins University

**Keith E Whitfield, PhD**

Duke University

### Abstract

Differential exposure to financial strain may explain some differences in population health. However, few studies have examined the cumulative health effect of financial strain across the life-course. Studies that have are limited to self-reported health measures. Our objective was to examine the associations between childhood, adulthood, and life-course, or cumulative, financial strain with disability, lung function, cognition, and depression. In a population-based cross-sectional cohort study of adult African-American twins enrolled in the US Carolina African American Twin Study of Aging (CAATSA), we found that participants who reported financial strain as children and as adults are more likely to be physically disabled, and report more depressive symptoms than their unstrained counterparts. Participants who reported childhood financial strain had lower cognitive functioning than those with no childhood financial strain. We were unable to detect a difference in lung function beyond the effect of actual income and education in those who reported financial strain compared to those who did not. Financial strain in adulthood was more consistently associated with poor health than was childhood financial strain, a finding that suggests targeting adult financial strain could help prevent disability and depression among African-American adults.

### Keywords

USA; financial strain; African Americans; disability; ethnicity; twins; lifecourse

## INTRODUCTION

The United States National Institutes of Health and the Institute of Medicine prioritize understanding and reducing socioeconomic health disparities. A vast body of evidence demonstrates that low income or low socioeconomic status affects poor health outcomes (Adler & Newman, 2002; Feinglass et al., 2007; House et al., 1994; Kanjilal et al., 2006; Minkler, Fuller-Thomson, & Guralnik, 2006; Rehkopf, Berkman, Coull, & Krieger, 2008; T. Seeman et al., 2008; Turrell, Lynch, Leite, Raghunathan, & Kaplan, 2007). It is not exactly clear, however, how low income has this effect. Hypothesized pathways include inadequate money to cover basic needs, access health care, or provide preventive health resources such as acceptable housing or education (Committee on Understanding and Eliminating Racial and

Correspondence to: Sarah L. Szanton.

**Publisher's Disclaimer:** This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Ethnic Disparities in Health Care, 2003). Because it is likely that the inadequacy of income is on that pathway, it may be preferable to measure the inadequacy of income to meet an individual's needs rather than the income itself. To determine whether income is adequate, it is necessary to have either access to objective data of an individual's cost of living (e.g., household size, transportation needs) or that person's subjective appraisal of income inadequacy known as financial strain. Financial strain could be considered an additional SES indicator based on the Oakes and Rossi (2003) definition of SES as "access to desired resources" (Oakes & Rossi, 2003). Although actual income is currently used as one proxy for socioeconomic status, financial strain provides additional information about access to resources as people with similar incomes may have wide variation in the financial strain they experience.

Financial strain, while related to income, measures the balance of income to need (Szanton et al., 2008). Financial strain has been consistently associated with poor health outcomes. For example, it is related to mortality (Szanton et al., 2008), poor self-rated health (Kahn & Pearlin, 2006), early disability (Matthews, Smith, Hancock, Jagger, & Spiers, 2005), increased psychological distress (Angel, Frisco, Angel, & Chiriboga, 2003; Ferraro & Su, 1999), and additional chronic conditions (Kahn & Pearlin, 2006). These studies, with the exception of Kahn and Pearlin's, have measured financial strain during adulthood only.

### **Life-course focus**

While measuring financial strain in adulthood is valuable, we hypothesized that including measurement of childhood financial strain would add value based on findings that the related but distinct phenomenon of enduring poverty, from childhood through adulthood, is more deleterious to health than intermittent poverty (McLeod & Shanahan, 1996; Turrell et al., 2007). Confirming this approach, the landmark Kahn and Pearlin study of financial strain and health over several time points (Kahn & Pearlin, 2006) found that persistent financial strain was more deleterious to health than was episodic financial strain. This important work, however, examined only subjective measures of health and focused on older adults only.

### **Cumulative Disadvantage Theory**

The objectives of this analysis are framed by the cumulative disadvantage theory. Cumulative disadvantage theory helps explain intra-cohort differentiation (Dannefer, 1987) by emphasizing early risk factors that shape trajectories not only for proximal outcomes but also distal ones. Early risk factors set children on a path of accumulating disadvantage. This disadvantage compounds over time by setting individuals up for subsequent increased risks. The compounding explains differential health trajectory heterogeneity in later life (Ferraro, Thorpe, McCabe, Kelley-Moore, & Jiang, 2006; O'Rand, 1996) depending on early and midlife advantages and disadvantages.

### **Psychosocial versus neo-material pathways for the relationship between financial strain and health**

Those who have examined the relationship between financial strain and health have focused on two different types of pathways: the psychosocial (Kahn & Pearlin, 2006) and the neo-material (Krieger, Chen, Coull, & Selby, 2005) both of which can be situated in a cumulative disadvantage context. The focus of psychosocial pathway investigations is on the physiological effects of chronic stressors (as in the allostatic load framework) in this paper represented by financial strain. In the allostatic load framework, stress reactions adaptive in an acute situation are deleterious in response to prolonged or repeated stressors (McEwen, 1998; T. E. Seeman et al., 2004; Szanton, Gill, & Allen, 2005). Based on this framework, the stress of financial strain over time would lead to increased stress-system activation that would, in turn, damage

tissue, accumulate metabolically active visceral fat, and over or under-regulate additional mechanisms with systemic effects ultimately leading to worse health outcomes.

In contrast, the neo-material perspective focuses on the direct effect of inadequate resources as a pathway between financial strain and poor health outcomes (Link & Phelan, 1996; Phelan, Link, Diez-Roux, Kawachi, & Levin, 2004). In this focus, lack of material resources, such as inadequate access to medical resources, food, and safe environments lead to poor health outcomes.

We are convinced by both approaches and suggest they are at least additive if not multiplicative. For example, if a child has frequent asthma attacks due to chronic stressors, the lack of access to medical care would be even more deleterious than if she had only frequent asthma attacks or only inadequate access to preventive health care. Therefore, we hypothesized that financial strain is related to health because of a combination of the inability to attain needed resources and the stress this insufficient financial means imposes (Pearlin, Schieman, Fazio, & Meersman, 2005).

#### **Four health outcomes representing physical and cognitive domains**

Using either the neo-material or psychosocial perspectives financial strain could be associated with many different health outcomes. For example from a neo-material perspective, attending an under-resourced school could lead to reduced “banking” of cognitive abilities (K. E. Whitfield & Wiggins, 2003) which could lead to a smaller cognitive function “cushion” in older years. From a psychosocial perspective, chronic stress from financial strain could impair glucocorticoid receptors through epigenetic changes which can subsequently influence depression (DeRijk et al., 2006; Oitzl, Champagne, van der Veen, & de Kloet, 2009). Financial strain could be associated with disability because those with inadequate means are more likely to have earlier morbidities that lead to disability such as congestive heart failure (Blair, Lloyd-Williams, & Mair, 2002) and arthritis (Jones, Power, & Macfarlane, 2009; Jordan, Thomas, Peat, Wilkie, & Croft, 2008). Lung function could be decreased with financial strain, as mentioned above, either through chronic activation of the stress response or through inadequate preventive medication, or living in more toxic neighborhoods both of which are more common for those with inadequate resources (Bryant-Stephens, 2009; Rauh, Landrigan, & Claudio, 2008). Therefore, to examine the global association of financial strain and health, we examined two measures of physical health (one self-report and one objective) and two measures of cognitive health (one subjective and one objective). The physical measures are disability and lung function, while the cognitive ones are depression and cognition.

#### **Objective**

The objective of the present analysis was to contribute to the understanding of the relationship between life-course financial strain and four different health outcomes in a population-based cohort of African Americans. As mentioned above, we sought to test the hypothesis that financial strain would be globally related to worse health by taking two physical, two cognitive, two self-report, two objective measures of health. The specific questions addressed in this paper were: (1) How is childhood financial strain and/or adult financial strain associated with physical disability, lung function, cognition and depression in African American adults? (2) Is life-course financial strain associated with physical disability, lung function, cognition and depression in African-American adults?

#### **Study Population**

Data for these analyses were obtained from the Carolina African American Twin Study of Aging (CAATSA) (K. E. Whitfield, Brandon, Wiggins, Vogler, & McClearn, 2003). The CAATSA was designed to examine the health status, cognitive functioning, and physical and

psychosocial functioning of adult African American twins. This population-based sample of participants was identified from birth records between the years of 1913 and 1975 from 23 vital statistics offices in North Carolina counties, U.S.A. Birth records were then entered into a computerized database of twin births. After the records were computerized, potential participants were located through voter registries and telephone white page searches.

The assessments were administered in person by a trained interviewer and consisted of structured assessments of demographic and socioeconomic information, self-reported health behaviors, personality, well-being, and aspects of mental and physical health, including quantitative assessments of lung function, cognition, and depression. Participants were enrolled between 1999 and 2003. All participants gave informed consent, and the study was approved by the Institutional Review Boards of the University of North Carolina Chapel Hill and Pennsylvania State University. Additional information regarding the CAATSA study design can be found elsewhere (Whitfield et al., 2003).

The final sample resulted in 706 interviews with 286 pairs of twins, 31 pairs of siblings and 72 surviving members of non-intact twin pairs. We analyzed data on 699 because 7 were missing complete data on financial strain.

### Financial Measures

These items are derived from the Longitudinal study on Aging which derived them from Pearlin and colleagues (Pearlin, Menaghan, Lieberman, & Mullan, 1981).

**Childhood financial strain**—Childhood financial strain was measured with the question: “How well off was your family when you were growing up? The five possible responses were: “Not getting by,” “Barely getting by,” “Doing OK,” “Doing well,” “Very well off.” These possible responses were followed with examples to standardize the responses, such as: “Doing OK means: had enough money for bills, food and a few of the extra things we wanted.” The responses were then dichotomized. Those who answered “Not getting by” or “Barely getting by” were considered to have experienced financial strain in childhood, and those who placed themselves in one of the other categories (“Doing OK,” “Doing well,” or “Very well off”) constituted the “no childhood financial strain” group.

**Adult financial strain**—Financial strain in adulthood was measured by the response to the question, “How well does your income cover your needs?” There were four possible responses: “Not very well,” “Poorly, but I get by,” “Pretty well,” “Very well.” We considered those respondents who reported “Not very well” or “Poorly, but I get by” to be the group with financial strain in adulthood and those answering “Pretty well” or “Very well” as the group without financial strain as adults.

**Measurement of Life-Course financial strain**—We then combined the data on childhood and adult financial strain to create the life-course financial strain variable. We created four mutually distinct financial strain categories, which we viewed as progressing from most to least detrimental: (1) childhood financial strain/adult financial strain, (2) child financial strain/no adult financial strain, (3) no childhood strain/adult financial strain, and (4) no childhood financial strain/no adult financial strain.

### Measures of Health Outcomes

**Physical Health**—Two parameters were used to assess physical health: physical disability and lung function.

**Disability:** The disability measure was based on the participant's report of difficulty in performing one or more of seven basic activities of daily living (ADLs): eating, dressing, grooming, walking, bathing, using the toilet, and transferring in and out of bed (KATZ, FORD, MOSKOWITZ, JACKSON, & JAFFE, 1963). A binary variable was created for each ADL to indicate whether or not the individual had difficulty in performing that specific activity. Summing these seven binary variables yielded a dichotomous variable for disability that allowed us to identify those individuals who had difficulty in a least one ADL (considered "disabled") versus those who had no difficulty in any ADL (considered "non-disabled") (Freedman, Martin, Schoeni, & Cornman, 2008).

**Lung function:** Lung function was measured using a Mini-Wright peak flow meter to assess the peak expiratory flow (PEF) for each individual. While standing, participants took a deep breath, covered the end of the tube of the peak flow meter with their lips, and blew as hard as possible for one second. Participants performed the test three times with an interval of at least 30 seconds between each PEF reading. The average of the three trials was used as the measure of lung function in the current analysis.

**Mental health: cognition and depression—**Cognition was assessed using the Telephone Interview of Cognitive Status (TICS) administered in person (Brandt & Spencer, 1988). The TICS is highly related to the Mini Mental Status Examination (MMSE) ( $r=0.94$ ), which is the most commonly used measure of mental status. The TICS is scored on a scale of 0 to 41, with individuals scoring below 30 being considered to have cognitive impairment (Brandt & Spencer, 1988). We restricted the cognition analyses to those in the cohort over age 50.

Depressive symptomatology was assessed using the 11-item version of the Center for Epidemiologic Studies-Depression (CES-D) scale, which is designed to assess frequency and severity of depressive symptoms during the previous week (Kohout, Berkman, Evans, & Cornoni-Huntley, 1993). Scores can range from 0 (reporting no depressive symptoms) to 33 (reporting more depressive symptoms). Participants who scored a 9 or above on this modified version of the instrument were classified as depressed (Kohout et al., 1993).

## Covariates

Possible confounders included in our analysis were reported household income (dichotomized as low income (less than \$1500 per month) or not (greater than or equal to \$1500 per month), education (in years), age (measured in years), height (in centimeters), gender (male, female), body mass index (weight in kilograms divided by height in meters squared), and self-reported cigarette pack-years (the number of smoking years times the number of packs smoked per day).

## Statistical Analysis

We calculated the mean and standard deviation (SD) for the demographic characteristics, financial strain, and health measures. We performed multivariable logistic regression for the binary outcome (disability) and multivariable linear regression for the continuous outcomes (lung function, cognition, and depression). All regressions were adjusted for income, years of education, body mass index, age, and cigarette pack-years. Regression models in which lung function was the outcome were also adjusted for height and gender. When cognition was the outcome variable, we also adjusted for depression. Participants in the "no childhood financial strain/no adult financial strain" served as the reference group for these comparisons. We also conducted separate tests for the main effects of financial strain in which we compared all those with financial strain in childhood to all those with no strain in childhood and in all those with financial strain in adulthood compared to all those with no financial strain in adulthood. In models that examined childhood financial strain only, we did not control for adult financial

strain and similarly did not control for childhood financial strain in models of adult financial strain.

Because the sample consisted of adult twin pairs, the independence of observations assumption was not upheld, making standard regression procedures inappropriate. Therefore, to account for twin-pair dependency both in the outcome and covariates, a multilevel model approach was employed using xtreg, xtlogit, and ologit with a cluster option (STATA, Inc., College Station, TX). This multilevel approach assumed that each participant was nested within a twin pair and allowed for a varying degree of covariation among twins depending on their twin status (i.e., monozygotic, dizygotic, same-sex dizygotic, or sibling) as in Thorpe et al (Thorpe, Szanton, & Whitfield, 2009). P-values <0.05 were considered statistically significant, and all tests were two-sided. All analyses were done in STATA, version 10.

## RESULTS

The 699 adults in this sample had a mean age of 50 (SD=14.6), with an age range of 22 – 92 years (Table 1). More had experienced financial strain as adults than as children (32.5% versus 22.5%). They had an average of one medical condition (SD, 1.14). Of the 699, 22% were disabled, and 52% had decreased pulmonary capacity (<80% of the predicted respiratory flow based on their gender, age, and height). (Table 1 about here).

### Physical Health results

**Disability**—Disability ranged from 4% of 20–30 year olds to 85% of those in 80–90 year olds. Strikingly, participants who reported financial strain at both time periods had 121% greater odds of being physically disabled than those who reported strain at neither time point (odds ratio [OR], 2.21; 95% confidence interval [CI], 1.13,4.33; Table 3), even after adjusting for income, education, body mass index, age and cigarette pack-years. Those who experienced no childhood strain but strain in adulthood were also significantly more likely to be disabled Odds Ratio of 1.82 (95% CI,1.03, 3.22) compared to those who reported no strain at either time point. Those who reported childhood financial strain (with or without adult financial strain) had no increased likelihood of disability when compared to those who did not (OR, 1.53; 95% CI, 0.74, 3.14). However, those who reported adult financial strain, whether or not they experienced financial strain in childhood, had an increased likelihood of disability when compared to those with no adult financial strain (OR, 1.83; 95% CI, 1.14, 2.94).

**Lung function**—Participants who reported financial strain at both time points had a 43.26-mL lower PEF value, independent of age, height, gender, and smoking history, than did the reference group who reported no strain at either time point (95% CI, -71.17, -15.25; data not shown). After adjustment for education and income, however, relationships between financial strain and lung function were non-significant at any time point (-21.45 mL/sec)(Table 3)

**Depression**—Participants with financial strain in both childhood and adulthood scored an average of 1.90 points higher on the depression scale (i.e., were more depressed) than did those who experienced no strain at either time (Table 3). Those who reported strain only in adulthood scored an average of 1.21 points higher on the depression scale ( $p<0.05$ ) than those who reported no strain. Those with strain only during childhood were no more likely to be depressed (mean score 0.61 points lower;  $p>0.05$ ) than those with no strain (Table 2). Those reporting childhood financial strain were no more depressed than were those with no childhood strain, but those who reported financial strain in adulthood scored an average of 1.44 points higher on the depression scale than did those with no strain during adulthood ( $p<0.05$ ) (Table 2)

**Cognition**—Participants who reported financial strain only in childhood were more likely to have a lower cognitive functioning score than those who reported no strain at either or both time points. Those who experienced childhood financial strain scored an average of 1.53 points lower on the TICS ( $p < 0.005$ ) than did those reporting no strain (Table 3).

## DISCUSSION

We found that life-course financial strain is significantly associated with depression, cognition, and disability in adult African Americans net of income, education and other important covariates (age, body mass index, smoking history). To our knowledge, this is the first time that disability, cognition, and depression measures have been associated with life-course financial strain in a mid life to older African American cohort.

The results of this study confirm reports from previous research indicating that cumulative low socioeconomic status is related to poor health (Kahn & Pearlin, 2006; Krieger et al., 2005; Pollitt et al., 2007; Turrell et al., 2002; Turrell et al., 2007) and that there is an association between financial strain in both childhood and adulthood for self-reported measures such as depression (Kahn & Pearlin, 2006). Kahn and Pearlin (2006), with a comparable number of African American participants, did not find a relationship between financial strain and depression in their African American sample. Their participants, however, were 65 years and older. As they describe, those with the strongest risks for poor health outcomes may not have lived to participate in their study. Because African-Americans face earlier morbidity and mortality, a cohort that has only those over 65 faces strong selection bias pressures.

Putting our findings into the cumulative disadvantage context, we found that for depression and disability, participants who reported both childhood and adult strain had worse health than those with strain at neither time point even accounting for current income and education. Cognition was only worse for those reporting childhood financial strain. Lung function was not related to financial strain after adjusting for income and education. Education and income were related to each outcome in the expected directions and the finding we report are in addition to these SES measurements.

Our findings, while robust, are not conclusive in terms of the neo-material versus psycho-social hazard interpretation of the financial strain's impact on health. The relationship between financial strain and these health outcomes could be from lack of resources themselves or the psychosocial strain that represents or both.

Depression is bi-directionally related to pervasive chronic health problems such as diabetes and heart disease. The current data does not allow us to address the causal pathway from financial strain to poor health outcomes but the relationship between financial strain and depression could be a credible target for further study.

Subjective data is subject to bias but both of our depression and disability measures are widely used, sensitive, specific, and predictive of future morbidity and mortality (Kivela & Pakkala, 2001; Mendes de Leon et al., 1998; Mezuk, Eaton, Albrecht, & Golden, 2008; Mezuk, Eaton, Golden, & Ding, 2008; Penninx et al., 1998; Penninx, Leveille, Ferrucci, van Eijk, & Guralnik, 1999). It may be that subjective data is more related to the psychosocial pathway of financial strain to poor health. If so, our results support the psychosocial pathway. Our findings on cognition could support either a neo-material or psychosocial pathway.

Our results are consistent with previous research by Matthews et al which showed an earlier risk of disability for those with inadequate income. However, the current study extends the conclusions to quite a different population (Matthews et al studied a largely affluent White British population). Our results also extend the inquiry into childhood financial strain enabling

us to use a life-course perspective and conclude that reporting adult financial strain and childhood strain seems to confer increased risk for depression, disability, and decreased cognition in African American adults.

We did not attempt to look for differences in adult health based on adult financial strain differences between pairs as there was not enough variance in adult SES to achieve this. Based on work by Krieger et al 2005, this was the original goal of the analysis. However, we found that the dyads had insufficiently different adult SES outcomes to be able to examine differences in health that might have derived from differences in SES. This led us to hypothesize a ceiling effect on education and income for the older age groups in this data set which we demonstrate in (Szanton, Johnson, Thorpe, & Whitfield, 2009).

It should be noted that the cross-sectional design of the CAATSA limits the assessment of temporal order among the variables and does not allow us to establish causality. For example, it is possible that poor adult physical function and depression could cause adult financial strain. This could be either because those with disability or depression might be less likely to obtain adequate employment or have higher living expenses. However, the prospective literature on financial strain and health outcomes does not support this interpretation (Ferraro & Su, 1999; Matthews et al., 2005).

Another limitation of the current study is that assessment of childhood financial strain was retrospective. It would have been more accurate to measure childhood financial strain during childhood. However, this is infeasible in a study involving adult health outcomes. Interviewers prompted participants by describing possible financial circumstances. This practice likely increased accuracy of participant answers. It is also important to emphasize that this study measured adult financial strain at one time (the time of the interview) and may therefore not be reflective of financial status throughout an individual's entire adulthood.

There are several advantages to examining this research question in an entirely African-American cohort. The main advantage is that it removes the confounding of race and socioeconomic status. Being African-American and poor in the 1930s to 1970s (when this cohort was young) was fundamentally different than being White and poor. Examining solely African-Americans raised at this time enables us to examine financial strain and infer back to the wider health disparities literature. The limitation is that it does not enable us to directly infer to White populations but we would hypothesize the findings would be similar.

A strength of the current analysis is that the data were drawn from a population-based study of African American twins from 23 counties in North Carolina. These participants ranged in age from 20s to 80s and were therefore born in or recently after the Jim Crow era of the American South and the subsequent Civil Rights movement. While African Americans still lag behind other groups in income, there were major advances during the life-times of our participants. Sadly, there were more participants who reported financial strain at adulthood than did at childhood. This may, however, be due to a more thorough, or realistic, knowledge of finances in adulthood compared to childhood.

The results of our analysis suggest that even when individuals have reached adulthood, it may not be too late to intervene in ways that can lessen financial strain and improve health. Of the four outcomes we examined, only cognition was compromised in individuals who reported no adult financial strain but did report childhood financial strain. Policies targeting financial strain in adulthood (providing more thorough prescription drug support or tax credits, for example) could potentially decrease disability, and depression in African Americans. Decreasing these health-related problems could provide societal savings through increased productivity and decreased health care costs (Fried, Ferrucci, Darer, Williamson, & Anderson, 2004; Miller et al., 2005; Wang, Simon, & Kessler, 2008).



## Acknowledgments

**Author Comments:** The CAATSA was funded by a grant from the National Institute on Aging (1R01-AG13662-01A2) to K.E.W. Research conducted by S.L.S. was supported by a grant from the National Center for Research Resources (NCRR), a component of the National Institutes of Health (NIH), and the NIH Roadmap for Medical Research (1KL2RR025006-01).

## References

- Adler NE, Newman K. Socioeconomic disparities in health: Pathways and policies. inequality in education, income, and occupation exacerbates the gaps between the health “haves” and “have-nots”. *Health Affairs (Project Hope)* 2002;21(2):60–76. [PubMed: 11900187]
- Angel RJ, Frisco M, Angel JL, Chiriboga DA. Financial strain and health among elderly mexican-origin individuals. *Journal of Health and Social Behavior* 2003;44(4):536–551. [PubMed: 15038148]
- Blair AS, Lloyd-Williams F, Mair FS. What do we know about socioeconomic status and congestive heart failure? A review of the literature. *The Journal of Family Practice* 2002;51(2):169. [PubMed: 11978216]
- Brandt J, Spencer M, FM. The telephone interview for cognitive status. *Neuropsychiatry, Neuropsychology, and Behavioral Neurology* 1988;1(2):111–117.
- Bryant-Stephens T. Asthma disparities in urban environments. *The Journal of Allergy and Clinical Immunology* 2009;123(6):1199–206. quiz 1207–8. [PubMed: 19501229]
- Smedley, B.; Stith, A.; Nelson, A., editors. Committee on Understanding and Eliminating Racial and Ethnic Disparities in Health Care. *Unequal treatment: Confronting racial and ethnic disparities in healthcare*. Washington D.C: National Academies Press; 2003.
- Dannefer D. Aging as intracohort differentiation: Accentuation, the matthew effect, and the life course. *Sociological Forum* 1987;2:211–236.
- DeRijk RH, Wust S, Meijer OC, Zennaro MC, Federenko IS, Hellhammer DH, et al. A common polymorphism in the mineralocorticoid receptor modulates stress responsiveness. *The Journal of Clinical Endocrinology and Metabolism* 2006;91(12):5083–5089. [PubMed: 17018659]
- Feinglass J, Lin S, Thompson J, Sudano J, Dunlop D, Song J, et al. Baseline health, socioeconomic status, and 10-year mortality among older middle-aged americans: Findings from the health and retirement study, 1992–2002. *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences* 2007;62(4):S209–17.
- Ferraro KF, Su Y. Financial strain, social relations, and psychological distress among older people: A cross-cultural analysis. *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences* 1999;54(1):S3–15.
- Ferraro KF, Thorpe RJ Jr, McCabe GP, Kelley-Moore JA, Jiang Z. The color of hospitalization over the adult life course: Cumulative disadvantage in black and white? *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences* 2006;61(6):S299–306.
- Freedman VA, Martin LG, Schoeni RF, Cornman JC. Declines in late-life disability: The role of early- and mid-life factors. *Social Science & Medicine* (1982) 2008;66(7):1588–1602.
- Fried LP, Ferrucci L, Darer J, Williamson JD, Anderson G. Untangling the concepts of disability, frailty, and comorbidity: Implications for improved targeting and care. *J Gerontol A Biol Sci Med Sci* 2004;59(3):255–263. [PubMed: 15031310]
- House JS, Lepkowski JM, Kinney AM, Mero RP, Kessler RC, Herzog AR. The social stratification of aging and health. *Journal of Health and Social Behavior* 1994;35(3):213–234. [PubMed: 7983335]
- Jones GT, Power C, Macfarlane GJ. Adverse events in childhood and chronic widespread pain in adult life: Results from the 1958 british birth cohort study. *Pain* 2009;143(1–2):92–96. [PubMed: 19304391]
- Jordan KP, Thomas E, Peat G, Wilkie R, Croft P. Social risks for disabling pain in older people: A prospective study of individual and area characteristics. *Pain* 2008;137(3):652–661. [PubMed: 18434022]
- Kahn JR, Pearlin LI. Financial strain over the life course and health among older adults. *Journal of Health and Social Behavior* 2006;47(1):17–31. [PubMed: 16583773]

- Kanjilal S, Gregg EW, Cheng YJ, Zhang P, Nelson DE, Mensah G, et al. Socioeconomic status and trends in disparities in 4 major risk factors for cardiovascular disease among US adults, 1971–2002. *Archives of Internal Medicine* 2006;166(21):2348–2355. [PubMed: 17130388]
- KATZ S, FORD AB, MOSKOWITZ RW, JACKSON BA, JAFFE MW. Studies of illness in the aged. the index of adl: A standardized measure of biological and psychosocial function. *JAMA: The Journal of the American Medical Association* 1963;185:914–919. [PubMed: 14044222]
- Kivela SL, Pahlkala K. Depressive disorder as a predictor of physical disability in old age. *Journal of the American Geriatrics Society* 2001;49(3):290–296. [PubMed: 11300240]
- Kohout FJ, Berkman LF, Evans DA, Cornoni-Huntley J. Two shorter forms of the CES-D (center for epidemiological studies depression) depression symptoms index. *Journal of Aging and Health* 1993;5(2):179–193. [PubMed: 10125443]
- Krieger N, Chen JT, Coull BA, Selby JV. Lifetime socioeconomic position and twins' health: An analysis of 308 pairs of united states women twins. *PLoS Medicine* 2005;2(7):e162. [PubMed: 16033303]
- Link BG, Phelan JC. Understanding sociodemographic differences in health—the role of fundamental social causes. *American Journal of Public Health* 1996;86(4):471–473. [PubMed: 8604773]
- Matthews RJ, Smith LK, Hancock RM, Jagger C, Spiers NA. Socioeconomic factors associated with the onset of disability in older age: A longitudinal study of people aged 75 years and over. *Social Science & Medicine* (1982) 2005;61(7):1567–1575.
- McEwen BS. Protective and damaging effects of stress mediators. *The New England Journal of Medicine* 1998;338(3):171–179. [PubMed: 9428819]
- McLeod JD, Shanahan MJ. Trajectories of poverty and children's mental health. *Journal of Health and Social Behavior* 1996;37(3):207–220. [PubMed: 8898493]
- Mendes de Leon CF, Krumholz HM, Seeman TS, Vaccarino V, Williams CS, Kasl SV, et al. Depression and risk of coronary heart disease in elderly men and women: New haven EPESE, 1982–1991. established populations for the epidemiologic studies of the elderly. *Archives of Internal Medicine* 1998;158(21):2341–2348. [PubMed: 9827785]
- Mezuk B, Eaton WW, Albrecht S, Golden SH. Depression and type 2 diabetes over the lifespan: A meta-analysis. *Diabetes Care* 2008;31(12):2383–2390. [PubMed: 19033418]
- Mezuk B, Eaton WW, Golden SH, Ding Y. The influence of educational attainment on depression and risk of type 2 diabetes. *American Journal of Public Health* 2008;98(8):1480–1485. [PubMed: 18556604]
- Miller JD, Foster T, Boulanger L, Chace M, Russell MW, Marton JP, et al. Direct costs of COPD in the U.S.: An analysis of medical expenditure panel survey (MEPS) data. *Copd* 2005;2(3):311–318. [PubMed: 17146996]
- Minkler M, Fuller-Thomson E, Guralnik JM. Gradient of disability across the socioeconomic spectrum in the united states. *The New England Journal of Medicine; the New England Journal of Medicine* 2006;355(7):695–703.
- Oakes JM, Rossi PH. The measurement of SES in health research: Current practice and steps toward a new approach. *Social Science & Medicine* (1982) 2003;56(4):769–784.
- Oitzl MS, Champagne DL, van der Veen R, de Kloet ER. Brain development under stress: Hypotheses of glucocorticoid actions revisited. *Neuroscience and Biobehavioral Reviews*. 2009
- O'Rand AM. The precious and the precocious: Understanding cumulative disadvantage and cumulative advantage over the life course. *The Gerontologist* 1996;36(2):230–238. [PubMed: 8920094]
- Pearlin LI, Schieman S, Fazio EM, Meersman SC. Stress, health, and the life course: Some conceptual perspectives. *Journal of Health and Social Behavior* 2005;46(2):205–219. [PubMed: 16028458]
- Penninx BW, Guralnik JM, Pahor M, Ferrucci L, Cerhan JR, Wallace RB, et al. Chronically depressed mood and cancer risk in older persons. *Journal of the National Cancer Institute* 1998;90(24):1888–1893. [PubMed: 9862626]
- Penninx BW, Leveille S, Ferrucci L, van Eijk JT, Guralnik JM. Exploring the effect of depression on physical disability: Longitudinal evidence from the established populations for epidemiologic studies of the elderly. *American Journal of Public Health* 1999;89(9):1346–1352. [PubMed: 10474551]
- Phelan JC, Link BG, Diez-Roux A, Kawachi I, Levin B. “Fundamental causes” of social inequalities in mortality: A test of the theory. *Journal of Health and Social Behavior* 2004;45(3):265–285. [PubMed: 15595507]

- Pollitt RA, Kaufman JS, Rose KM, Diez-Roux AV, Zeng D, Heiss G. Early-life and adult socioeconomic status and inflammatory risk markers in adulthood. *European Journal of Epidemiology* 2007;22(1): 55–66. [PubMed: 17225957]
- Rauh VA, Landrigan PJ, Claudio L. Housing and health: Intersection of poverty and environmental exposures. *Annals of the New York Academy of Sciences* 2008;1136:276–288. [PubMed: 18579887]
- Rehkopf DH, Berkman LF, Coull B, Krieger N. The non-linear risk of mortality by income level in a healthy population: US national health and nutrition examination survey mortality follow-up cohort, 1988–2001. *BMC Public Health* 2008;8:383. [PubMed: 19000311]
- Seeman TE, Crimmins E, Huang MH, Singer B, Bucur A, Gruenewald T, et al. Cumulative biological risk and socio-economic differences in mortality: MacArthur studies of successful aging. *Social Science & Medicine* (1982) 2004;58(10):1985–1997.
- Seeman T, Merkin SS, Crimmins E, Koretz B, Charette S, Karlamangla A. Education, income and ethnic differences in cumulative biological risk profiles in a national sample of US adults: NHANES III (1988–1994). *Social Science & Medicine* 2008;66(1):72–87. [PubMed: 17920177]
- Szanton SL, Allen JK, Thorpe RJ Jr, Seeman T, Bandeen-Roche K, Fried LP. Effect of financial strain on mortality in community-dwelling older women. *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences* 2008;63(6):S369–74.
- Szanton SL, Gill JM, Allen JK. Allostatic load: A mechanism of socioeconomic health disparities? *Biological Research for Nursing* 2005;7(1):7–15. [PubMed: 15919999]
- Szanton SL, Johnson B, Thorpe RJ, Whitfield K. Education in time: Cohort differences in educational attainment in african-american twins. *PLoS One* 2009;4(10):e7664. [PubMed: 19888338]
- Thorpe RJ Jr, Szanton SL, Whitfield K. Association between lung function and disability in african-americans. *Journal of Epidemiology and Community Health* 2009;63(7):541–545. [PubMed: 19282315]
- Turrell G, Lynch JW, Kaplan GA, Everson SA, Helkala EL, Kauhanen J, et al. Socioeconomic position across the lifecourse and cognitive function in late middle age. *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences* 2002;57(1):S43–51.
- Turrell G, Lynch JW, Leite C, Raghunathan T, Kaplan GA. Socioeconomic disadvantage in childhood and across the life course and all-cause mortality and physical function in adulthood: Evidence from the alameda county study. *Journal of Epidemiology and Community Health* 2007;61(8):723–730. [PubMed: 17630374]
- Wang PS, Simon GE, Kessler RC. Making the business case for enhanced depression care: The national institute of mental health-harvard work outcomes research and cost-effectiveness study. *Journal of Occupational and Environmental Medicine/American College of Occupational and Environmental Medicine* 2008;50(4):468–475. [PubMed: 18404020]
- Whitfield KE, Wiggins SA. The impact of desegregation on cognition among older african-americans. *Journal of Black Psychology* 2003;3:275–291.
- Whitfield KE, Brandon DT, Wiggins S, Vogler G, McClearn G. Does intact pair status matter in the study of african american twins? the carolina african american twin study of aging. *Experimental Aging Research* 2003;29(4):407–423. [PubMed: 12959875]

Table 1

Select sample characteristics in the Carolina African American Twin Study of Aging (N = 699) by Time of Reported Financial Strain

	Total (N= 699)	Childhood and adult <sup>a</sup> (N = 77)	Childhood only <sup>b</sup> (N= 79)	Adult only <sup>c</sup> (N = 151)	No strain <sup>d</sup> (N = 392)
Mean age, years (SD)	49.8 (14.6)	56 (14.5)	52.4 (14.4)	50.5 (14.6)	47 (13.9)
Mean BMI	29.5 (6.78)	30.7 (8.6)	28.6 (5.6)	29.9 (7.4)	29.4 (6.3)
Disabled, %	22.4	41.6	24.1	32.4	14.6
Decreased Pulmonary Capacity <sup>f</sup> %	52.0	58.9	56.6	60.8	45.0
Depression Score <sup>g</sup>	6.1 (5.5)	7.8 (5.8)	5.1 (5.0)	7.5 (5.9)	5.5 (5.3)
Cognition score <sup>i</sup>	30.5	28.6 (5.9)	29.6 (4.5)	29.5 (5.0)	31.5 (4.8)

<sup>a</sup> financial strain at both childhood and adulthood

<sup>b</sup> financial strain in childhood only

<sup>c</sup> financial strain in adulthood only

<sup>d</sup> financial strain at neither time point.

<sup>e</sup> Percentage of participants reporting that they have difficulty in at least one Activity of Daily Living (see text for details)

<sup>f</sup> < 80% of the expected PEF for the individual's height, age, and gender.

<sup>g</sup> Measured with the short form of the CES-D. Scores >9 are considered to indicate depression.

<sup>h</sup> Number of diagnosed conditions reported from the following list: hypertension, diabetes, stroke, arthritis, and heart disease.

<sup>i</sup> Assessed with the TICS. Scores <30 are considered indicative of cognitive impairment.

**Table 2**

Health Status of African Americans with childhood or adult financial strain (N= 699)

Financial Strain		
	Childhood strain <sup>a</sup>	Adulthood strain <sup>b</sup>
Disability, OR (95% CI)	1.50 (0.90, 2.49)	<b>1.83 (1.14, 2.94)</b>
Lung Function, mL/sec (95% CI)	-16.96 (-37.86, 3.94)	-9.52 (-28.14, 9.10)
Cognition, mean score (95% CI)	<b>-1.83 -2.86, -0.80)</b>	-0.33 (-1.04, 0.98)
Depression, mean score (95% CI)	0.29 (-0.71, 1.30)	<b>1.44 (0.53, 2.36)</b>

<sup>a</sup> As compared to no financial strain in childhood.

<sup>b</sup> As compared to no financial strain in adulthood.

The values for continuous variables (PEF, cognition, depression score) are regression coefficients and 95% confidence intervals.

Those for the dichotomous variable (disability) are odds ratios and 95% confidence intervals.

All variables were adjusted for education, income, body mass index, age and cigarette pack years. PEF was also adjusted for height and gender. Cognition was also adjusted for depression.

Significant results are in **boldface** type.

**Table 3**

Health Status of African Americans According to Time of Reported Financial Strain (N= 699)

	Disability (OR and 95% CI)	Lung Function ( $\beta$ and SE)	Cognition ( $\beta$ and SE)	Depression ( $\beta$ and SE)
<b>Financial Strain</b>				
Childhood and adulthood financial strain	<b>2.21 (1.13–4.33)</b>	–21.46 (14.9)	–0.1 (0.62)	<b>1.90 (0.70)</b>
Childhood strain only	1.53 (0.74–3.14)	–16.70 (14.24)	<b>–1.53 (0.67)</b>	–0.61 (.69)
Adult strain only	<b>1.82 (1.03 – 3.22)</b>	–8.47 (11.12)	0.62 (0.57)	<b>1.21 (.55)</b>
No strain (index)	---	---	---	---
Age	<b>1.06 (1.04–1.08)</b>	<b>–3.0 (1.43)</b>	<b>–0.08(0.03)</b>	<b>–0.07 (.017)</b>
Pack years	0.94 (0.63 – 1.39)	–13.20 (8.22)	–0.29 (0.32)	---
BMI	<b>1.05 (1.02 – 1.09)</b>	–0.80 (0.65)	0.01 (0.03)	–0.01 (.03)
Education	0.98 (0.91 – 1.06)	<b>5.37 (1.58)</b>	<b>0.67 (0.07)</b>	<b>–0.18 (.08)</b>
Low income	<b>2.20 (1.32 – 3.66)</b>	<b>–30.87 (9.95)</b>	<b>–2.75 (0.51)</b>	<b>1.6 (0.49)</b>
Height	---	<b>3.63 (1.43)</b>	---	---
Gender	---	<b>–76.99 (11.50)</b>	---	---

The values for continuous variables (PEF, cognition, depression score) are regression coefficients and standard errors confidence intervals.

Those for the dichotomous variable (disability) are odds ratios and 95% confidence intervals.

Significant results are in **boldface** type.