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Childhood socio-economic status and the onset, persistence, and severity of DSM-IV mental disorders in a US national sample

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ABSTRACT

Although significant associations between childhood socio-economic status (SES) and adult mental disorders have been widely documented, SES has been defined using several different indicators often considered alone. Little research has examined the relative importance of these different indicators in accounting for the overall associations of childhood SES with adult outcomes. Nor has previous research distinguished associations of childhood SES with first onsets of mental disorders in childhood, adolescence, and adulthood from those with persistence of these disorders into adulthood in accounting for the overall associations between childhood SES and adult mental disorders. Disaggregated data of this sort are presented here for the associations of childhood SES with a wide range of adult DSM-IV mental disorders in the US National Comorbidity Survey Replication (NCS-R), a nationally-representative sample of 5692 adults. Childhood SES was assessed retrospectively with information about parental education and occupation and childhood family financial adversity. Associations of these indicators with first onset of 20 DSM-IV disorders that included anxiety, mood, behavioral, and substance disorders at different life-course stages (childhood, adolescence, early adulthood, and mid-later adulthood) and the persistence/severity of these disorders were examined using discrete-time survival analysis. Lifetime disorders and their ages-of-onset were assessed retrospectively with the WHO Composite International Diagnostic Interview. Different aspects of childhood SES predicted onset, persistence, and severity of mental disorders. Childhood financial hardship predicted onset of all classes of disorders at every life-course stage with odds-ratios (ORs) of 1.7–2.3. Childhood financial hardship was unrelated, in comparison, to disorder persistence or severity. Low parental education, although unrelated to disorder onset, significantly predicted disorder persistence and severity, whereas parental occupation was unrelated to onset, persistence, or severity. Some, but not all, of these associations were explained by other co-occurring childhood adversities. These specifications have important implications for mental health interventions targeting low-SES children.

Introduction

Accumulating evidence suggests that childhood socio-economic status (SES) is an important marker of early-life environmental conditions that has lasting effects on health across the life-course (Davey Smith, Blane, & Hawthorne, 1997; Marmot, Shipley, Brunner, & Hemingway, 2001; Power et al., 2007). Although much of the research on this topic has focused on physical health and mortality (Cohen, Janicki-Deverts, Chen, & Matthews, 2010; Galobardes, Lynch, & Davey Smith, 2004), significant associations between childhood SES and adverse mental health outcomes in adulthood also have been reported in numerous studies (Fan & Eaton, 2001; Gilman, Kawachi, Fitzmaurice, & Buka, 2002; Gilman, Kawachi, Fitzmaurice, & Buka, 2003; Lundberg, 1993; Marmot, Shipley, Brunner, & Hmingway, 2001; Power & Manor, 1992). However, knowledge of the relationship between childhood SES and adult mental health remains cursory due to several pervasive limitations in existing research. First, the specific dimensions of childhood SES that predict adult mental health remain to be identified due to a lack of studies that include a range

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of childhood SES indicators. Second, the extent to which childhood SES is associated with specific mental disorders or to other aspects of psychiatric morbidity such as disorder persistence and severity is unclear, as most studies have examined associations only with psychological distress. Third, because previous research has not had information on the age-of-onset of psychiatric outcomes, we know little about when in the life-course childhood SES first has effects on mental health. Finally, although the association between childhood SES and adult mental health may be accounted for by a wide range of other childhood adversities (CAs) that co-occur with low SES, existing research has largely failed to control for these important confounders. We address these gaps in the literature in the current report.

Dimensions of socioeconomic status

Childhood SES might contribute to the subsequent development of psychopathology through a number of pathways that are differentially related to aspects of childhood SES (Braveman et al., 2005; Galobardes, Shaw, Lawlor, Lynch, & Davey Smith, 2006; Krieger, Williams, & Moss, 1997; Lynch & Kaplan, 2000). The three primary indicators of childhood SES are parental educational attainment, parental occupational status, and financial adversity. Low educational attainment reflects a persistent disadvantage in relative social position that is a marker of one's access to resources, knowledge, and social structures that promote health and well-being. Perceptions of low relative status may have pernicious psychological effects by engendering social comparisons that generate negative affect and feelings of low self-worth (Wilkinson, 1996; Wilkinson & Pickett, 2007). Parental occupation also is associated with prestige and with differential exposure to harsh work conditions that could have spillover effects into the levels of stress experienced by children at home. In contrast, earning income that is inadequate for subsistence is an indicator of deprivation in actual resources that are needed to sustain health, such as adequate food, shelter, and access to health care. Threatened or actual material deprivation resulting from financial hardship may generate anxiety and worry that increase risk for psychopathology.

Although it is likely that these indicators have differential associations with mental health outcomes, many studies have utilized a single indicator of SES or a single composite made by combining information across indicators (Gilman et al., 2003; Marmot et al., 2001; Power, Hertzman, Matthews, & Manor, 1997; Power & Manor, 1992). Previous studies have therefore been unable to disentangle the effects of different aspects of childhood SES on adult psychopathology. Consideration of the effects of these indicators simultaneously may reveal differentiation that has theoretical and practical significance (Kessler, 1982). For example, one previous study found that economic hardship in childhood was associated with adult psychological distress whereas parental educational attainment was not (Lahelma, Laaksonen, Martikainen, Rahkonen, & Sarlio-Lähteenkorva, 2006), suggesting that the focus of preventive interventions should be on financial stress.

Dimensions of psychiatric morbidity

Most research on the long-term effects of childhood SES has examined its associations with psychological distress rather than with psychiatric disorders (Lahelma et al., 2006; Lundberg, 1993; Marmot et al., 2001; Power & Manor, 1992). Although some prior studies have examined mental disorders, many have focused exclusively on major depression (Fan & Eaton, 2001; Gilman et al., 2003; Ritsher, Warner, Johnson, & Dohrenwend, 2001; Stansfeld, Clark, Rodgers, Caldwell, & Power, 2008), precluding examination of differential effects of childhood SES across the full range of mental disorders. Although numerous psychiatric outcomes were examined in one prior study of adolescent mental disorders (Miech, Caspi, Moffitt, Wright, & Silva, 1999), we are unaware of similar studies examining adult psychopathology. Importantly, no attempt has been made in past studies to distinguish associations of childhood SES with first onsets of mental disorders at different life-course stages. This is an important omission, because a majority of adults with mental disorders met criteria for a disorder in childhood or adolescence (Kessler et al., 2005; Kim-Cohen et al., 2003) *before* their adult SES was established. Because early-onset disorders are associated with the development of comorbid disorders later in life, the associations of childhood SES with adult disorders might be explained completely by greater onset of childhood disorders among individuals with low SES. Alternatively, associations of childhood SES with adult mental health may simply reflect the persistence of childhood disorders into adulthood. Prior studies of childhood SES have, with rare exceptions (Gilman et al., 2003), failed to distinguish effects on disorder onset from disorder persistence. Distinguishing between these two possibilities is important, because the intervention implications would be quite different if childhood SES predicts new onsets of mental disorders in adulthood than if childhood SES were simply associated with a more chronic course of disorders beginning earlier in life.

Other childhood adversities

Low childhood SES is associated with increased exposure to a range of other CAs such as parental psychopathology, maltreatment, and family violence (Tracy, Zimmerman, Galea, McCauley, & Stoep, 2008; Turner, Finkelhor, & Ormrod, 2006) that are associated with psychiatric disorders in adulthood (Green et al., 2010; Kessler, Davis, & Kendler, 1997; McLaughlin et al., 2010a,b). These CAs are likely confounders of the childhood SES-adult psychopathology association. Although several prior studies have examined this possibility, they have been restricted in the types of CAs considered (Gilman et al., 2002; Lundberg, 1993; Mäkinen, Laaksonen, Lahelma, & Rahkonen, 2006; Sadowski, Ugarte, Kolvin, Kaplan, & Barnes, 1999; Veijola et al., 1998). Childhood SES remained significantly associated with adult mental health after controlling for CAs in several of these studies (Lundberg, 1993; Sadowski et al., 1999) but not in others (Mäkinen et al., 2006).

We address these limitations in past work using data from a national survey of the US population. We disaggregate the associations of lifetime DSM-IV disorders with three different childhood SES indicators (parental education, parental occupation, and financial hardship) as they separately predict the onset, persistence, and severity of mental disorders at various life-course stages. In addition, we examine these associations after controlling for a wide range of other CAs.

Methods

Sample

The NCS-R was a face-to-face household survey of English-speaking respondents ages 18 and older carried out between February 2001 and April 2003 in a nationally-representative multi-stage clustered area probability sample of the US household population (Kessler & Merikangas, 2004). The response rate was 70.9%. The survey was administered in two parts. Part I included a core diagnostic assessment of mental disorders ($n = 9282$). Part II assessed risk factors, consequences, other correlates, and additional disorders that were administered to all Part I respondents who met lifetime criteria for a disorder plus a probability sub-sample of other

respondents ($n = 5692$). The Part I sample was weighted to adjust for differential probabilities of selection within households. The Part II sample was weighted to adjust for selection probabilities. A final weight adjusted the Part II sample to match the 2000 census population on a cross-classification of a number of geographic and socio-demographic variables. All analyses are based on the weighted Part II sample. More information about the NCS-R sampling design and weighting is reported elsewhere (Kessler, Berglund, Chiu, Demler, Heeringa, Hiripi et al., 2004). Recruitment and consent procedures were approved by the human subjects committees of Harvard Medical School and the University of Michigan.

Measures

Diagnostic assessment

NCS-R diagnoses are based on Version 3.0 of the World Health Organization Composite International Diagnostic Interview (CIDI) (Kessler & Üstun, 2004), a fully-structured lay-administered interview that generates diagnoses according to DSM-IV criteria. Diagnoses comprise four broad classes that include 20 specific disorders: Mood disorders [major depressive disorder, dysthymic disorder, bipolar I and II disorder, and sub-threshold BPD], anxiety disorders (panic disorder, agoraphobia without a history of panic disorder, generalized anxiety disorder, specific phobia, social phobia, post-traumatic stress disorder, separation anxiety disorder), behavior disorders (intermittent explosive disorder, attention-deficit/hyperactivity disorder, oppositional-defiant disorder, conduct disorder), and substance disorders (alcohol abuse, alcohol dependence with abuse, drug abuse, drug dependence with abuse). The prevalence and distribution of these disorders in the NCS-R has been reported previously (Kessler et al., 2005). As detailed elsewhere (Kessler et al., 2004), blinded clinical reappraisal interviews with a probability sub-sample of NCS-R respondents found generally good concordance between DSM-IV diagnoses based on the CIDI and those based on clinical interviews.

The CIDI assessed age-of-onset (AOO) of disorders retrospectively. A special question sequence was used to improve accuracy of onset reporting: "Can you remember your *exact* age the *very first time* when you (had the symptom/the syndrome)?" Respondents who answered "no" were probed for a bound of uncertainty by moving up the age range incrementally (e.g. "Was it before you went to school?"; "Was it before you were a teen?"). Onset was set at the upper end of the bound of uncertainty (e.g., age 12 for respondents who reported that onset was before the beginning of their teens). Experimental research has shown that this approach yields more plausible responses than standard AOO questions (Knauper, Cannell, Schwarz, Bruce, & Kessler, 1999). Time-since-onset (TSO) was calculated by subtracting AOO from age at interview.

Disorder persistence

Persistence of disorders is a function of both episode duration and recurrence risk. Longitudinal studies can calculate persistence directly from information about duration of incident episodes, time to recurrence after incident episode offset, duration of second episodes, and so on, although this is difficult logistically even in multi-wave prospective studies (Yonkers, Bruce, Dyck, & Keller, 2003). It is impossible to measure persistence directly using retrospective assessments, but persistence can be estimated indirectly from the ratio of current prevalence to lifetime prevalence. This approach uses only part of the information about recency of disorders, though, as data are also collected on age at offset of the most recent episode among lifetime cases in the CIDI. This information can be used to estimate disorder persistence more accurately using a special class of survival models, described in more detail below.

Disorder severity

The Sheehan Disability Scales (SDS) (Leon, Olfson, Portera, Farber, & Sheehan, 1997) were used to assess disorder-specific impairment in role performance in work, household maintenance, social life, and intimate relationships for mood, anxiety, and behavior (but not substance) disorders. The SDS asked respondents to think of the month in the past year when the focal disorder was most severe and to rate on a 0–10 visual analog scale how much the disorder caused impairments in each domain (where 0 = none, 1–3 = mild, 4–6 = moderate, 7–9 = severe, and 10 = very severe). Respondents who received a score of severe or very severe in any of the four domains were classified 'severe' for the current analyses.

Childhood SES

Parental education was classified into four categories: less than high school graduation (0–11 years), high school graduation (12 years), some post high school education (13–15 years), and college graduation (16+ years). Occupations were classified into 28 categories and 10 major groups defined by the International Standard Classification of Occupations of the International Labour Organization (ISCO-88) (Hussmanns, Mehran, & Verma, 1990). The 10 major groups were further classified into skill-level categories defined by ISCO-88 as elementary (unskilled and semi-skilled labor), low-average prestige (clerks, service and sales, skilled workers, craft and related, and plant/machine operators), high-average prestige (technicians), and high prestige (professionals). Although not assigned a skill level in the ISCO-88 classification, members of the armed forces were classified as low-average prestige and legislators were classified as high prestige. Respondents were classified in terms of the higher education and occupation level of either parent if scores were available for both and at elementary occupation if neither parent worked. Financial hardship was assessed in a question that asked respondents whether their family ever received government assistance in the form of food stamps, welfare checks, or other forms of financial aid before they were 18 years of age.

Childhood adversities

Eleven CAs occurring before age 18 were assessed in the NCS-R. These include three types of interpersonal loss (parental death, parental divorce, and other loss of contact with parents), four types of parental maladjustment (mental illness, substance abuse, criminality, and inter-parental violence), three types of maltreatment (physical abuse, sexual abuse, neglect), and serious respondent physical illness. The interpersonal losses were assessed with measures of parental death, divorce, and other parental separations (e.g., adoption, foster placement, living with other relatives instead of parents). Parental mental illness (major depression, generalized anxiety disorder, panic disorder, antisocial personality disorder) and substance abuse were assessed with the Family History Research Diagnostic Criteria Interview (Endicott, Andreasen, & Spitzer, 1978) and its extensions (Kendler et al., 1991). Family violence and physical abuse were assessed with a modified version of the Conflict Tactics Scale (Straus, 1979). Sexual abuse was assessed with questions about repeated fondling, attempted rape, and rape. Neglect was assessed using questions commonly used in studies of child welfare (Courtney, Piliavin, Grogan-Kaylor, & Nesmith, 1998).

Data analysis

Associations between childhood SES and disorder onset were examined using discrete-time survival analysis with person-year as the unit of analysis (Singer & Willett, 1993). Initial analyses were carried out by stacking the 20 separate disorder-specific person-year files and including 19 dummy predictor variables that distinguished among these files, thereby forcing the estimated slopes of the disorders on childhood SES to be the same across all disorders.

Disorder-specific models were subsequently examined to investigate differences in slopes across disorders. The initial model examined the effects of all childhood SES variables simultaneously. Subsequent models added controls for number and type of CAs (Green et al., 2010). These models were examined in the total data array and in subsamples defined by life-course stage (childhood: ages 4–12; adolescence: ages 13–19; early adulthood: ages 20–29; and middle-later adulthood: ages 30+).

Associations between childhood SES and disorder persistence were examined using a special class of survival models known as backward recurrence models (Alison, 1984; Yamaguchi, 2003). These models use a person-year survival approach to predict current prevalence among lifetime cases and recency of the last episode of a focal disorder among respondents with a lifetime history of that disorder who are not in episode at the time of interview. The outcome is the number of years between the age at interview and the most recent episode. Longer survival times indicate longer periods of remission. Person-years prior to the most recent episode are censored. These models controlled for AOO and TSO.

The associations of childhood SES with disorder severity were investigated using logistic regression models that were estimated among respondents with an episode of each focal disorder in the 12 months prior to the survey to predict probability of being classified as 'severe' on any of the four subscales of the SDS. Logistic regression coefficients and their standard errors were exponentiated and are reported as odds-ratios (ORs) and 95% confidence intervals (CIs). All models included controls for age at interview, gender, and race-ethnicity (Non-Hispanic White, Non-Hispanic Black, Hispanic, Other). Because the NCS-R data are both clustered and weighted, the design-based Taylor series method implemented in the SUDAAN software system (Research Triangle Institute, 2002) was used to estimate standard errors. Significance was evaluated using 0.05-level two-sided tests.

Results

Associations of childhood adversities with childhood SES and DSM-IV/CIDI disorders

We first conducted a series of analyses to determine whether CAs were associated with childhood SES and mental disorders and thus should be controlled in subsequent analysis. The 11 CAs were related both to childhood SES and to psychiatric disorders. Childhood SES indicators were examined as predictors of each of the 11 CAs in a series of logistic regression models, with controls for age, gender, and race/ethnicity. Financial hardship was associated with 10 of the 11 CAs, whereas parental educational attainment and occupation were associated with 5 and 6 of the CAs. (Table 1)

Associations between CAs and psychiatric disorders were examined in a series of logistic regression models predicting the subsequent onset of each disorder, controlling for age, gender, and race/ethnicity. Of the 11 CAs, 10 were associated significantly with disorder onset (ORs = 1.1–1.9). Detailed associations between CAs and disorders in the NCS-R have been reported previously (Green et al., 2010).

Associations between childhood SES and first onset of DSM-IV/CIDI disorders

In the initial model examining the associations of childhood SES with first onset of the 20 pooled DSM-IV/CIDI disorders, only financial hardship was a significant predictor of disorder onset (OR = 1.9, $\chi^2_1 = 42.4$, $p < .001$). (Table 2) After controlling for CAs, the association between financial hardship and disorder onset was no longer significant.

Table 1
Multivariate associations (odds-ratios) between childhood SES and childhood adversities[a] ($n = 4780$).

		Childhood Adversities																					
	N	Parent died			Parent divorce			Other parent loss			Parent mental			Parent substance			Parent criminal			Family violence			Physical abuse			Sexual abuse			Neglect			Physical illness		
		%	(95% CI)		%	(95% CI)		%	(95% CI)		%	(95% CI)		%	(95% CI)		%	(95% CI)		%	(95% CI)		%	(95% CI)		%	(95% CI)		%	(95% CI)		%	(95% CI)	
Parent education																																			
0–11 years	1073	0.8	0.6–1.3		1.0	0.7–1.4		2.4	1.3–4.2		0.8	0.5–1.1		1.2	0.8–1.9		2.4	1.4–4.2		2.0	1.4–2.7		1.7	1.1–2.5		0.7	0.5–1.0		2.4	1.5–3.9		1.2	0.8–1.8	
12 years	1856	1.2	0.7–1.8		1.3	1.0–1.6		2.2	1.3–4.0		0.9	0.6–1.1		1.4	0.9–2.1		2.0	1.2–3.2		1.6	1.1–2.2		1.3	1.0–1.8		1.1	0.8–1.6		2.1	1.3–3.4		0.8	0.6–1.2	
13–15 years	708	0.9	0.5–1.4		1.5	0.9–2.5		1.4	0.7–2.9		0.8	0.5–1.2		1.5	0.9–2.5		1.4	0.7–2.7		1.3	1.0–1.8		1.4	0.9–2.0		1.5	1.0–2.3		2.1	1.3–3.4		1.2	0.8–1.7	
16 + years	1143	–	–		–	–		–	–		–	–		–	–		–	–		–	–		–	–		–	–		–	–		–	–	
χ^2_3 (*p*-value)		3.5 (0.330)			6.0 (0.110)			12.8 (0.010)*			2.0 (0.580)			3.7 (0.300)			20.8 (<0.001)*			21.2 (<0.001)*			7.0 (0.070)			10.2 (0.020)*			19.0 (<0.001)*			5.9 (0.110)	
Parent occupation																																			
Never worked	18	1.3	0.2–7.6		0.4	0.1–1.7		28.7	10.5–78.7		2.0	0.4–9.2		3.5	1.0–12.0		7.2	1.1–48.6		1.0	0.3–4.1		2.4	0.7–8.1		2.0	0.4–9.4		3.9	0.9–16.2		1.2	0.1–10.0	
Elementary	459	1.2	0.7–2.0		0.8	0.5–1.4		2.2	1.2–3.7		0.8	0.4–1.4		1.3	0.9–2.0		2.1	1.2–3.5		1.1	0.7–1.9		1.1	0.8–1.5		1.0	0.6–1.6		1.2	0.5–2.7		1.2	0.8–2.0	
Low-average prestige	2362	0.9	0.6–1.3		1.2	1.0–1.5		1.9	1.3–2.9		1.2	1.0–1.5		2.1	1.6–2.6		2.0	1.3–3.0		1.8	1.4–2.2		1.6	1.2–2.0		1.1	0.8–1.5		1.7	1.1–2.8		1.3	1.0–1.8	
High-average prestige	481	1.1	0.7–1.8		1.3	0.8–2.1		1.5	0.9–2.6		1.2	0.9–1.7		1.6	1.0–2.6		1.4	0.8–2.4		1.8	1.2–2.7		1.0	0.7–1.6		1.2	0.7–1.8		1.6	0.8–3.0		1.0	0.6–1.8	
High prestige	1460	–	–		–	–		–	–		–	–		–	–		–	–		–	–		–	–		–	–		–	–		–	–	
χ^2_4 (*p*-value)		1.9 (0.750)			4.6 (0.330)			51.7 (<0.001)*			5.0 (0.290)			31.4 (<0.001)*			13.1 (0.010)*			32.0 (<0.001)*			14.1 (0.010)*			1.9 (0.760)			15.2 (<0.010)*			3.6 (0.470)	
Financial hardship																																			
Yes	323	2.4	1.5–3.9		3.2	2.0–5.2		3.5	2.4–5.3		3.2	2.3–4.5		4.7	3.3–6.8		3.8	2.7–5.3		4.8	3.2–7.0		3.4	2.3–4.9		2.5	1.6–4.0		5.0	3.5–7.2		1.2	0.8–1.8	
No	4457																																		
χ^2_1(*p*-value)		13.4 (<0.001)*			24.3 (<0.001)*			36.6 (<0.001)*			47.8 (<0.001)*			69.7 (<0.001)*			58.2 (<0.001)*			61.8 (<0.001)*			38.1 (<0.001)*			14.8 (<0.001)*			76.7 (<0.001)*			0.5 (0.470)	

*Significant at the 0.05 level, two-sided test.
[a] Model controlled for age, gender, and race/ethnicity.

We next replicated the analysis to predict disorders separately within classes. Financial hardship predicted onset of each of the four classes of disorders (ORs = 1.7–2.1, $\chi^2_1 = 22.4–35.1$, $p < .001$). None of these associations were sustained after adjustment for CAs.

Associations between childhood SES and disorder onset at different life-course stages

Replication in subsamples of person-years defined by life-course stage showed that financial hardship was associated with disorder onset at every life-course stage (ORs = 1.4–2.3, $\chi^2_1 = 6.2–43.1$, $p = .010–<0.001$). (Table 3) The magnitude of this association decreased significantly with age ($\chi^2_3 = 9.8$, $p < .05$). In the model that includes CA controls, financial hardship remained significantly associated with disorder onset only in childhood (OR = 1.3, $\chi^2_1 = 4.7$, $p = .030$). Parent occupation also predicted disorder onset in childhood ($\chi^2_3 = 8.9$, $p = .030$), with respondents whose parents had high-average prestige occupations at lower risk for disorder onset (OR = 0.8) than respondents whose parents had high prestige occupations.

Associations between childhood SES and persistence of DSM-IV/CIDI disorders

Childhood SES was not associated with persistence of pooled DSM-IV/CIDI disorders in the backward recurrence model. (Appendix table available at: http://www.hcp.med.harvard.edu/ncs/publications.php.) Disaggregation of this model, though, revealed differential associations across the four disorder classes. Parental education was associated with persistence of behavior disorders ($\chi^2_3 = 9.6$, $p = .020$), with persistence greatest among respondents whose parents had less than a high school education (OR = 1.6) relative to those whose parents had a college education. This association persisted even after controlling for CAs ($\chi^2_3 = 12.1$, $p = .010$). None of the other indicators of childhood SES predicted disorder persistence.

Associations between childhood SES and severity of DSM-IV/CIDI disorders

Lower parental education (ORs = 1.5–1.8, $\chi^2_3 = 10.4$, $p = .020$) and financial hardship (OR = 1.7, $\chi^2_1 = 4.9$, $p = .030$) were associated with elevated odds of being classified as severe on the SDS. (Table 4) The disorders of respondents whose parents had a high school education or less (ORs = 1.6–1.8) were more likely to be severe than those of respondents whose parents had a college education. When controls for CAs were added to the model, parental education continued to predict disorder severity for all disorder classes ($\chi^2_3 = 8.5–13.3$, $p = .040–0.010$), such that the disorders of respondents whose parents had less than a college education were most likely to be severe.

Table 2
Multivariate associations (odds-ratios) between childhood SES and the onset of DSM-IV/CIDI disorders[a,b]

	Any disorder		Mood		Anxiety		Substance		Behavior	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
I. Without CA controls[b]										
Parent occupation										
Never worked/elementary	0.9	(0.8–1.2)	0.9	(0.7–1.2)	1.0	(0.8–1.4)	0.7	(0.5–1.1)	1.0	(0.7–1.6)
Low-average prestige	1.1	(0.9–1.2)	1.0	(0.9–1.2)	1.1	(1.0–1.3)	1.0	(0.8–1.3)	1.1	(0.8–1.5)
High-average prestige	0.9	(0.8–1.1)	0.8	(0.6–1.0)	0.9	(0.7–1.1)	1.0	(0.7–1.4)	1.0	(0.7–1.4)
High prestige	–		–		–		–		–	
χ^2_3	4.6		5.3		5.3		3.2		0.4	
Parent education										
0–11 years	1.0	(0.8–1.2)	0.9	(0.7–1.1)	1.0	(0.8–1.2)	0.9	(0.7–1.3)	1.2	(0.8–1.8)
12 years	1.0	(0.9–1.2)	0.9	(0.8–1.1)	1.0	(0.8–1.2)	1.1	(0.8–1.4)	1.1	(0.8–1.5)
13–15 years	1.0	(0.9–1.2)	0.9	(0.7–1.1)	1.1	(0.9–1.3)	1.0	(0.7–1.4)	1.2	(0.9–1.7)
16+ years	–		–		–		–		–	
χ^2_3	0.4		1.4		0.9		1.4		2.2	
Financial hardship										
Yes	1.9*	(1.6–2.3)	1.7*	(1.4–2.1)	1.9*	(1.5–2.3)	2.1*	(1.6–2.6)	2.1*	(1.6–2.8)
χ^2_1	42.4*		22.4*		35.1*		33.5*		23.3*	
II. With CA controls[c]										
Parent occupation										
Never worked/elementary	0.9	(0.7–1.1)	0.9	(0.7–1.2)	1.0	(0.8–1.3)	0.7	(0.5–1.0)	0.9	(0.6–1.3)
Low-average prestige	1.0	(0.8–1.1)	0.9	(0.8–1.1)	1.0	(0.9–1.2)	0.9	(0.7–1.1)	1.0	(0.7–1.4)
High-average prestige	0.8	(0.7–1.0)	0.8	(0.6–0.9)	0.8	(0.7–1.0)	1.0	(0.7–1.3)	1.0	(0.7–1.3)
High prestige	–		–		–		–		–	
χ^2_3	4.2		7.4		5.3		3.3		0.3	
Parent education										
0–11 years	1.0	(0.8–1.2)	0.9	(0.7–1.2)	1.0	(0.8–1.2)	1.0	(0.7–1.3)	1.1	(0.8–1.6)
12 years	1.0	(0.9–1.2)	0.9	(0.8–1.1)	1.0	(0.9–1.2)	1.1	(0.8–1.4)	1.1	(0.8–1.4)
13–15 years	1.0	(0.9–1.2)	0.9	(0.7–1.1)	1.1	(0.9–1.2)	1.0	(0.8–1.3)	1.2	(0.9–1.7)
16 + years	–		–		–		–		–	
χ^2_3	0.4		1.8		0.9		0.9		1.8	
Financial hardship										
Yes	1.2	(1.0–1.4)	1.2	(0.9–1.4)	1.2	(1.0–1.6)	1.2	(0.9–1.5)	1.2	(0.9–1.6)
χ^2_1	2.5		1.8		3.3		0.9		1.0	
(n_1/n_2)[d]	(4780/344,299)		(4780/96,537)		(4780/130,781)		(4780/76,671)		(4780/28,646)	

*Significant at the 0.05 level, two-tailed.
[a] Models were estimated in a discrete-time survival framework with childhood SES variable and controls used to predict the first onset of each outcome disorder. There were a total of 4780 respondents with information on childhood SES included in the analysis and we considered a total of 20 outcome disorders.
[b] Model included all childhood SES variables and controlled for person-year, age, sex, race, and the diagnostic categories included in the pooled data file.
[c] Model included covariates for the 11 CAs. See Methods Section for details.
[d] n_1 = the number of respondents included in the analysis; n_2 = the number of person-years included in the analysis.

Sensitivity analysis

We evaluated whether the associations between childhood SES and disorder severity changed when we adjusted for the respondent's educational attainment and past-year family income in the model that included controls for CAs. Childhood parental education, which was the only significant SES indicator in that model, remained a significant predictor of disorder severity for anxiety, mood, and behavior disorders when we controlled respondent education and past-year income ($\chi^2_3 = 9.3–14.1$, $p = .003–0.026$).

Discussion

This study provides useful new information about the associations of childhood SES with the onset, course, and severity of mental disorders. The reliance on retrospective reports is a potential limitation because of the possibility of recall bias (Simon & von Korff, 1995) which may persist despite the use of methods for prompting accurate recall of the onset and offset of disorders (Knauper et al., 1999). Although retrospective studies in representative samples such as this provide an opportunity to investigate broad population patterns, replication of our findings in prospectively followed cohorts, such as the Great Smoky Mountain and Dunedin studies, is an important goal for future research. An additional noteworthy limitation is that we did not control for adult SES in our analysis of disorder onset and persistence. Although some studies have found that the association between childhood SES and adult mental health disappears after accounting for adult SES (Marmot et al., 2001; Stansfeld et al., 2008), others have found that the association persists (Huurre, Aro, & Rahkonen, 2003; Mäkinen et al., 2006; Power et al., 2007) Importantly, the association between childhood SES and adult mental disorder cannot be explained by adult SES if disorder onset occurs *prior* to the establishment of adult SES, a critical limitation that has not been addressed in existing research. Indeed, we found that childhood SES was most strongly related to disorder onsets occurring in childhood and adolescence, *before* the establishment of adult SES. Moreover, our sensitivity analysis showed that the associations between parental education and severity of adult disorders remained significant after adjustment for the respondent's SES in adulthood. Finally, this study relied on data from a U.S. sample. These findings therefore warrant replication in samples drawn from other settings and cultural contexts.

Within the context of these limitations the results of this study extend the literature on childhood SES and psychiatric disorders by showing that this relationship is more complex than has previously been shown to be the case, with different indicators of childhood SES predicting onset, persistence, and severity of a wide range of mental disorders. Four results are especially noteworthy. First, we found that the traditional indicators of childhood SES, parent education and occupation, did not predict disorder onset, but that financial hardship predicted disorder onset at every stage of the life-course. This finding is consistent with evidence that childhood financial hardship is more strongly associated with mental

Table 3
Multivariate associations (odds-ratios) between childhood SES and the onset of DSM-IV/CIDI disorders at four life-course stages.[a]

	Person-years							
	4–12		13–19		20–29		30+	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
I. Without CA controls								
Parent occupation								
Never worked/elementary	1.0	(0.7–1.3)	0.9	(0.6–1.3)	1.0	(0.8–1.4)	0.9	(0.6–1.4)
Low-average prestige	1.0	(0.9–1.3)	1.0	(0.8–1.3)	1.0	(0.8–1.2)	1.2*	(1.0–1.6)
High-average prestige	0.8	(0.7–1.0)	1.0	(0.8–1.3)	1.0	(0.7–1.2)	0.9	(0.6–1.2)
High prestige	–		–		–		–	
χ^2_3	5.9		1.1		0.4		7.7*	
Parent education								
0–11 years	1.0	(0.8–1.3)	1.0	(0.7–1.3)	0.9	(0.6–1.2)	1.0	(0.7–1.4)
12 years	1.0	(0.8–1.3)	1.0	(0.8–1.2)	1.0	(0.8–1.3)	1.0	(0.8–1.2)
13–15 years	1.2	(1.0–1.5)	1.0	(0.8–1.2)	1.0	(0.8–1.3)	0.9	(0.6–1.2)
16+ years	–		–		–		–	
χ^2_3	3.9		0.2		2.3		0.6	
Financial hardship								
Yes	2.3*	(1.8–2.9)	1.9*	(1.5–2.4)	1.8*	(1.4–2.4)	1.4*	(1.1–1.9)
χ^2_1	43.1*		24.1*		16.4*		6.2*	
II. With CA controls								
Parent occupation								
Never worked/elementary	0.9	(0.7–1.1)	0.9	(0.6–1.4)	1.0	(0.8–1.3)	0.9	(0.6–1.3)
Low-average prestige	0.9	(0.8–1.1)	0.9	(0.8–1.1)	0.9	(0.8–1.1)	1.1	(0.9–1.4)
High-average prestige	0.8	(0.6–0.9)	0.9	(0.7–1.2)	0.9	(0.7–1.1)	0.8	(0.6–1.2)
High prestige	–		–		–		–	
χ^2_3	8.9*		0.8		1.9		4.6	
Parent education								
0–11 years	1.0	(0.8–1.3)	1.0	(0.7–1.3)	0.9	(0.7–1.1)	1.0	(0.8–1.4)
12 years	1.0	(0.9–1.3)	1.0	(0.8–1.2)	1.0	(0.8–1.3)	1.0	(0.8–1.3)
13–15 years	1.2	(1.0–1.4)	1.0	(0.8–1.2)	1.0	(0.8–1.3)	0.9	(0.7–1.2)
16+ years	–		–		–		–	
χ^2_3	4.0		0.3		4.1		0.9	
Financial hardship								
Yes	1.3*	(1.0–1.6)	1.1	(0.9–1.4)	1.2	(0.9–1.6)	1.0	(0.8–1.4)
χ^2_1	4.7*		0.7		2.0		0.1	
(n1/n2)[b]	(4780/81,668)		(4780/61,777)		(4615/74,026)		3693/126,828)	

*Significant at the 0.05 level, two-tailed.

[a] See footnote 1 to Table 2 for a description of the dataset, overall modeling approach, and control variables.

[b] n_1 = the number of respondents included in the analysis; n_2 = the number of person-years included in the analysis.

disorders than parental education and occupation (Lahelma et al., 2006), and suggests that material deprivation is more strongly associated with the onset of psychiatric disorders than indicators of relative status.

Second, financial hardship was associated with elevated risk of initial disorder onset across all four disorder classes considered here and in all four life-course stages, although the magnitude of this association decreased significantly with age. These findings are consistent with previous research showing a strong relationship between child poverty and child psychopathology (Goodman, Slap, & Huang, 2003; McLeod & Shanahan, 1996), and extend this literature by documenting a breadth of the association between childhood financial hardship and mental disorders over the life-course that has, to our knowledge, never before been demonstrated. This pattern of findings adds to a growing evidence base supporting social causation rather than social selection theories of SES and psychopathology (Johnson, Cohen, Dohrenwend, Link, & Brook, 1999; Ritsher et al., 2001).

Third, the association between financial hardship and subsequent onset of mental disorders remained significant only in childhood once we controlled for CAs, suggesting that exposure to CAs explains the association between financial hardship and onset of mental disorders in adolescence and adulthood. These findings provide indirect evidence for the role of early exposure to stress as a pathway linking childhood SES to adult mental health, in addition to the previously documented socio-economic pathway (Stansfeld et al., 2008). This finding has implications for interventions aimed at reducing the mental health consequences of childhood poverty and underscores the importance of ameliorating the adverse emotional effects of a wide range of CAs when targeting preventive interventions to children in low-SES families.

Fourth, we found associations between parental education and disorder persistence and severity, which were not explained by CAs. Low parental education was associated with persistence of behavior disorders, and with severity of mood, anxiety, and behavior disorders. The number of these associations is striking, especially because parental education was not a significant predictor of disorder onset. These findings suggest that, in contrast to our results for disorder onset, disadvantaged relative position in childhood predicts disorder persistence and severity in adulthood more strongly than material deprivation. Parental education may be a marker of access to resources that promote recovery from mental illness, such as mental health treatment, or may confer protection against the adverse social consequences of mental disorders. For example, greater educational attainment is associated with reduced stigma towards individuals with mental illness (Corrigan & Watson, 2007), which may improve parental

Table 4
Multivariate associations (odds-ratios) between childhood SES and severe scores on the Sheehan Disability scales among respondents with 12-month DSM-IV/CIDI disorders ($n = 3448$)[a]

	Any disorder		Any mood		Any anxiety		Any behavior[e]	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
I. Without CA controls[b]								
Parent occupation								
Never worked/elementary	1.0	(0.6–1.6)	1.2	(0.5–2.7)	1.0	(0.6–1.7)	1.8	(0.7–5.1)
Low-average prestige	1.0	(0.7–1.4)	0.9	(0.5–1.5)	1.1	(0.8–1.6)	0.9	(0.4–1.7)
High-average prestige	1.0	(0.7–1.6)	1.0	(0.4–2.4)	1.2	(0.8–1.8)	0.8	(0.2–3.0)
High prestige	–		–		–		–	
χ^2_3	0.1		0.7		1.4		2.3	
Parent education								
0–11 years	1.6*	(1.0–2.7)	2.6	(1.3–5.4)	1.4	(0.8–2.5)	1.5	(0.7–3.2)
12 years	1.8*	(1.2–2.5)	1.5	(0.8–2.7)	1.6*	(1.1–2.4)	1.6	(0.8–3.2)
13–15 years	1.5*	(1.0–2.4)	2.2	(1.1–4.4)	1.4	(0.8–2.4)	0.5	(0.2–1.2)
16+ years	–		–		–		–	
χ^2_3	10.4*		13.3*		10.6*		8.0*	
Financial hardship								
Yes	1.7*	(1.1–2.8)	1.5	(0.8–2.9)	1.8*	(1.0–3.0)	1.3	(0.5–3.1)
χ^2_1	4.9*		1.6		4.3*		0.3	
II. With CA controls[c]								
Parent occupation								
Never worked/elementary	1.0	(0.6–1.7)	1.4	(0.6–3.3)	1.0	(0.6–1.7)	2.8	(0.7–10.2)
Low-average prestige	0.9	(0.7–1.2)	0.8	(0.5–1.4)	1.0	(0.7–1.4)	0.8	(0.3–2.0)
High-average prestige	1.0	(0.7–1.6)	0.9	(0.4–2.2)	1.1	(0.7–1.7)	1.0	(0.3–3.8)
High prestige	–		–		–		–	
χ^2_3	0.8		1.9		0.3		6.7	
Parent education								
0–11 years	1.7*	(1.1–2.6)	2.6*	(1.3–5.3)	1.5	(0.9–2.5)	1.2	(0.5–3.1)
12 years	1.8*	(1.3–2.4)	1.5	(0.8–2.7)	1.7*	(1.3–2.3)	1.4	(0.6–3.4)
13–15 years	1.6*	(1.0–2.4)	2.4*	(1.2–4.8)	1.6*	(1.0–2.4)	0.3	(0.1–1.0)
16 + years	–		–		–		–	
χ^2_3	13.3*		13.1*		14.5*		8.5*	
Financial hardship								
Yes	1.4	(0.9–2.4)	1.4	(0.7–2.8)	1.4	(0.8–2.6)	1.2	(0.6–2.6)
χ^2_1	2.0		0.8		1.5		0.2	
(n_1)[d]	(9432)		(1243)		(4128)		(527)	

*Significant at the 0.05 level, two-sided test.

[a] Models were estimated using logistic regression with severity defined as a score of 7–10 on any of the 4 subscales on the Sheehan Disability Scale among those with a 12-month diagnosis.

[b] Model included all childhood SES variables and controlled for age category, time-since-onset, sex, race, and diagnosis category.

[c] Model included additional covariates for the 11 CAs.

[d] n_1 = the number of disorders included in the analysis.

[e] Conduct disorder is not included as the Sheehan scale was not administered for conduct disorder.

support for individuals with psychiatric disorders. The fact that behavior disorders were found to be involved in many of these associations is noteworthy. It may be that the relatively early age-of-onset of behavior disorders (Kessler et al., 2005; Nock, Kazdin, Hiripi, & Kessler, 2007) accounts for the fact that childhood SES is more consistently associated with the persistence-severity of these disorders, a possibility that requires further investigation.

Importantly, we found that active associations of childhood SES with psychiatric disorders continue to exist in adulthood, particularly with disorder persistence and severity. We can conclude from the associations documented here that no single underlying causal pathway is likely to explain the numerous patterns that make up the overall relationship between childhood SES and psychiatric morbidity. Although we saw that a number of the component associations are due to a larger constellation of CAs associated with low childhood SES, others persist even after controlling for these CAs. A number of plausible biological, psychological, structural, and socio-economic mediators are likely involved in these remaining associations (Cohen et al., 2010). Investigation of the relative strength of these mediators requires more focused study in future investigations.

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