Child socioeconomic status, childhood adversity and adult socioeconomic status in a nationally representative sample of young adults

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ABSTRACT

Introduction: Numerous studies have examined the consequences of childhood adversity (CA) and socioeconomic status (SES) for health over the life course. However, few studies have examined the relation between childhood SES and CA as well as the influence of CA on adult SES. The objective of this study was to examine direct and indirect associations between childhood SES, CA and adult SES.
Methods: Participants in the National Longitudinal Study of Adolescent to Adult Health, (N = 6844) reported on nine CA experiences. Childhood SES was characterized as a composite measure of parental highest education level, median household income, and parental occupational status. Adult SES was characterized as composite measure of highest education level attained at age 37, median household income and occupation.
Results: In mediation analyses, adjusted for age, race and sex pathways were noted in that lower child SES was associated with CAs and CAs were associated with lower adult SES. Furthermore, CAs partially mediated the relation between childhood SES and adult SES. The proportion mediated by CA was small and only noted among African-American (4%) and White participants (5%).
Conclusions: Childhood SES is associated with CAs. In turn, CAs are associated with lower adult SES, independent of childhood SES supporting the notion that intervening on CAs early on in the lifecourse could influence health and wellbeing throughout the life course.

1. Introduction

Childhood adversity (CA) has been implicated in health outcomes across the life course, ranging from behavioral problems in childhood to cardiovascular disease in adulthood (Shonkoff & Garner, 2012; Suglia et al., 2018). CAs are defined as experiences that threaten the child's bodily, familial, or social safety or security and broadly encompass experiences of maltreatment, household dysfunction and exposure to crime (Midei & Matthews, 2011; Slopen et al., 2014; Suglia et al., 2015). Unfortunately these experiences are common; data from the Behavioral Risk Factor Surveillance System (BRFSS) demonstrates that 59% of the US adult population has experienced at least one adverse childhood event (Merrick et al., 2018). In addition, the accumulation of these adversities has been shown to be more detrimental to health than experiencing one adversity in a dose response fashion (Currie et al., 2020; Felitti, Anda, Nordenberg, & et al., 1998a, 1998b). Individual adversities as well as the accumulation of CAs, have been associated with negative mental and physical health outcomes in childhood, adolescence and adulthood (Schilling et al., 2007). The Adverse Childhood Experiences study noted a higher risk of depression, suicidal ideation, obesity, stroke, ischemic heart disease and myocardial infarction with increasing number of adversities in childhood (Felitti et al., 1998a, 1998b). More recent studies in younger populations have also shown that adversities are associated with lower educational attainment,

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depression, anxiety, substance use, obesity and hypertension (Houtepen et al., 2020a, 2020b; Liu et al., 2019; Suglia et al., 2018).

Extensive literature has shown that low socioeconomic status (SES) is a fundamental cause of adverse outcomes across the life course (Katikireddi et al., 2017; Link & Phelan, 1995). Socioeconomic status in childhood, commonly operationalized as parental educational attainment and/or household income has been associated with multiple disease outcomes (e.g., cardiovascular health, depression, obesity, diabetes) in adulthood (Pollitt et al., 2008; Reiss, 2013) which are also known to be associated with CAs (Merrick et al., 2018). Evidence from prospective studies have demonstrated the importance of childhood SES on long term health outcomes. In a longitudinal study of children from the Dunedin Multidisciplinary Health and Development Study in New Zealand, researchers found that children who grew up in low SES households had poorer cardiovascular, dental, and substance use outcomes at 26 and 32 years of age compared to children who grew up in high SES households (Melchior et al., 2007; Poulton et al., 2002). Retrospective studies have also demonstrated similar associations. Data from the Wroclaw Growth Study in Poland showed that self-reported childhood SES was associated with cardiovascular disease among 50 year old women (Lipowicz et al., 2007).

Over the life course, SES and CAs have been shown to be interrelated, yet few studies have attempted to disentangle the relation between child SES, CA and adult SES. Clarifying the relation between SES and CA could have implications for how we intervene to prevent CA and its associated negative health outcomes (Shaefer et al., 2018; Suglia et al., 2020). First, childhood SES is associated with CA exposure. A recent systematic review noted numerous studies that demonstrated associations between lower child SES and higher prevalence of experiencing maltreatment, an association that held across various countries and varying measures of SES and maltreatment (Walsh et al., 2019). A smaller body of work has also shown an SES gradient with other (non-maltreatment) individual CA experiences and cumulative CA. (Abramsky et al., 2011; Halfon et al., 2017; Shaefer et al., 2018) For example, utilizing data from the National Survey of Children's Health in the US, Halfon and colleagues noted a steep economic gradient in that the number of CAs increase as household income decreases (Halfon et al., 2017). Second, CA exposure is related to adult SES. Liu and colleagues examined BRFSS data demonstrating that unemployment rates were higher among participants retrospectively reporting any CA compared to those reporting none (Liu et al., 2013). Studies have also demonstrated that an accumulation of CAs is associated with lower educational attainment. A recent retrospective study using 2010 BRFSS data found that participants with higher CA scores were more likely to not have completed high school compared to participants with lower ACE scores (Metzler et al., 2017). Prospective studies have also noted that experiences of child maltreatment, a component of CAs, are associated with lower educational attainment in adulthood (Currie & Widom, 2010; Jaffee et al., 2018). A recent prospective study using data from the Avon Longitudinal Study of Parents and Children (ALSPAC) found that higher CA scores were associated with lower educational attainment even after adjusting for markers of childhood SES (e.g household social class, mother and partner's highest educational qualifications) (Houtepen et al., 2020a, 2020b). Lastly, an extensive literature recently reviewed, has noted child SES to be associated with adult SES (Duncan et al., 2017). Specifically, childhood SES has been shown to predict earning in adulthood as well as educational and attainment in adulthood (Duncan & Magnuson, 2012). However, its largely unknown whether experiences of CA mediate the association between childhood and adult SES.

Race/ethnicity may also modify the effect of CAs on adult SES. Minoritized populations experience a higher prevalence of adversity at the individual, neighborhood and national/state level as well as additional exposure to certain types of adversity, such as racism and discrimination, not experienced by racial majority groups (Heard-Garris et al., 2018; Priest et al., 2014; Suglia et al., 2020). Additionally, living in lower income neighborhoods may exacerbate the impact of CAs on adult SES. Similarly, the impact of lower child SES on CAs experiences may be higher under these conditions (Liu et al., 2018; Suglia et al., 2020).

Using data from the National Longitudinal Study of Adolescent to Adult Health, a nationally representative sample of adolescents in high school in the US, we examine whether childhood adversity mediates the relation between childhood SES and adult SES, conceptualized as a composite of educational attainment, occupation, and household income in adulthood. Furthermore, we examine whether these associations are modified by race/ethnicity.

2. Methods and procedures

2.1. Study population

The National Longitudinal Study of Adolescent to Adult Health (Add Health) is a nationally representative school-based, longitudinal study of the health-related behaviors of adolescents and their outcomes in young adulthood. An in-school questionnaire was administered to a nationally representative sample of students in grades 7 through 12, plus selected oversampled minority groups, stratified by age and sex, during the 1994–1995 school year in 132 schools. The study design has been described in detail elsewhere (Popkin & Udry, 1998). Briefly, 80 high schools representative of US schools were selected with respect to region of country, urbanicity, size, type and ethnicity. Eligible schools included an 11th grade and enrolled more than 30 students. The first wave of in-home interviews was conducted among adolescents 12–18 years of age between 1994 and 1995 (Wave 1). Wave 2 (1996; mean age 16 years) follow-up was conducted one year after Wave 1, and included 13, 570 adolescents who would still be enrolled in high school during 1996, including those that dropped out since Wave 1, who were part of the nationally representative sample. Three additional waves of data were collected: Wave 3 (2001–2002; mean age 22 years), Wave 4 (2007–2008; mean age 29 years) and Wave 5 (2016–2018; mean age 37 years). In these analyses our sample consists of participants who participated in waves 1 through 5 and were part of the nationally representative sample (N = 7295). Those missing all childhood SES information (parental occupation, household income and parental education) (N = 49), all adult SES measures (education, income, and occupation) (N = 5), and age or sex (N = 2) were excluded. In addition, given small sample size, those who were not White non-Hispanic, African American, Asian or Hispanic were excluded (N = 211); the final analytic sample was comprised of 6844 participants. The Add Health study was approved by the institutional review board of the University of North Carolina, Chapel Hill. Informed consent of participants was provided in written form. The current analyses were approved by the institutional review board of Emory University.

2.2. Childhood adversity

Based on previous literature(Doom et al., 2017), an index of child adversities was created from retrospective reports of adverse experiences reported by participants at waves 1, 2 and 3. Similar to the Adverse Childhood Experiences Scale (Felitti et al., 1998a, 1998b) we included measures of abuse and neglect: sexual abuse, physical abuse and physical neglect, household dysfunction (i.e., parental alcohol use problems) and parental separation (i.e., parental death and parental incarceration). We furthermore included measures of witnessing/experiencing violence, dating violence, and homelessness. These items have been previously noted to contribute to childhood adversities and to have lifelong health consequences (Table 1). (Felitti et al., 1998a, 1998b; Wade et al., 2014) Dichotomous variables were created for each of the 9 items and were summed; the child adversity scale ranged from 0 to 9 but was truncated for analyses at 5 or more adversities given sparse data.

Table 1
Childhood Adversity Item description.

CA Item	Wave of Assessment	Assessment description
Parental Alcohol Problems	**Wave 1**	Caretakers were asked whether the child's biological mother or father had a problem with alcoholism.
Witnessing/ Experiencing Violence	**Wave 1**	Adolescents were asked whether during the past 12 months they had witnessed someone shoot or stab another person, or whether they experienced being jumped, cut or stabbed, being shot at, someone pulled a knife or gun on them or whether they experienced a physical fight.
Dating Violence	**Wave 2**	Adolescents were asked about their current and past relationships, up to three relationships. Adolescents were asked if their partner called them names, insulted or treated them disrespectfully, whether the partner swore, threaten with violence, push or shoved them or threw something at them that could hurt them.
Child abuse and neglect	**Wave 3**	Participants were asked prior to starting the 6th grade (approximately 11 years of age) "How often had your parents or adult caregivers not taken care of your basic needs such as keeping you clean or providing food or clothing". Child neglect was defined as occurring if participants reported this occurred at least once. Participants were also asked "How often had your parents or other adult care-givers slapped, hit, or kicked you? and "How often had one of your parents or adult care-givers touched you in a sexual way, forced them to touch him or her in a sexual way, or forced you to have sexual relations?". Physical abuse was defined as endorsing one time or more to the first question and sexual abuse as endorsing one or more times to the second question
Parental Incarceration	**Wave 4**	Has biological mother, father, mother figure or father figure had spent time in jail or prison and how old they were when their biological or parental figure went to prison. Parental incarceration was defined as endorsing any of the above questions that occurred prior to the adolescent's 18th birthday.
Parental death	**Wave 2**	Has biological mother or father passed away prior to the adolescents 16th birthday.
Homelessness	**Wave 3**	Participants were asked if they ever been homeless for a week or longer with homeless being defined as sleeping in a place where people weren't meant to sleep, or in a homeless shelter, or if they didn't have a regular residence in which to sleep. Participants were also asked if they've ever stayed in a homeless shelter. Homelessness was defined as endorsing at least one of questions.

2.3. Socioeconomic status

A composite measure of childhood socioeconomic status was created based on parental education, parental occupation and household income (Link et al., 2017). Parental education was based on the highest education level attained by either the mother or the father, reported by the participants during wave 1. Parental education was classified into three groups as: 1) less than high school, or high school graduate or vocational school, 2) some college, 3) college graduate or graduate education. Parental occupation was based on the highest occupational level of

either the mother or the father as reported at wave 1 and was categorized into three groups: 1) Professional or manager; 2) Technical, office worker, sales; 3) service industry, transportation, construction or military. Household income during childhood was based on parental report of household income at wave 1. High, medium and low household income categories were created based on household income tertiles. Childhood SES was characterized as the average of the sum of parental education, parental occupation and household income with higher scores representing higher SES (range 0–6). Additionally, we characterized child SES as low, medium or high, based on score tertiles (Link et al., 2017). A similar composite measure of adulthood SES was created based on participant education, occupation and household income assessed in Wave 5 (mean age 37 years). Participant education was classified into three groups as: 1) less than high school, or high school graduate or vocational school, 2) some college, or 3) college graduate or graduate education. Participant occupation was categorized into three groups: 1) Professional or manager; 2) Technical, office worker, sales; 3) service industry, transportation, construction or military. High, medium and low household income categories were created based on tertiles of household income. Adulthood SES was characterized as the average of the sum of participant education, occupation and household income with a higher score (range 0–6) representing greater SES. Additionally, we characterized adult SES as low, medium or high, based on score tertiles (Link et al., 2017).

2.4. Covariates

Questionnaires ascertained information on socio-demographic factors, including age, sex and race/ethnicity. Participants were asked "What is your sex?" with possible responses as being male or female. We acknowledge this does not allow for consideration of gender or sexual identity. Self-identified race/ethnicity was categorized as White non-Hispanic, African American, Asian, or Hispanic.

2.5. Data analyses

First, participant characteristics including demographics, childhood and adult SES and CAs overall and by race/ethnicity were examined with chi-square tests and ANOVA. Second, the relation of CAs with childhood SES was examined. Multivariable linear regression models examined the association between CA index and childhood SES (tertiles) adjusted for sociodemographic factors (race/ethnicity, sex and age); an interaction between CA index and race/ethnicity was also examined. We additionally examined the distribution of mean CA index by tertiles of childhood SES across racial/ethnic groups adjusted for sex and age. Third, multinomial logistic regression models were conducted to examine the association between CA index (continuous) and adult SES (tertiles), adjusting for sociodemographic factors (age, race/ethnicity and sex).

Lastly, to simultaneously test the direct and indirect effects of childhood SES (continuous) on adulthood SES (continuous) potentially mediated through CA, a full mediation path analysis model was constructed using Mplus software (Muthen, 2011). Models were conducted using maximum likelihood with robust standard error to obtain the standardized estimates and standard errors for the total effects (TE), direct effects (DE), and indirect effects (IDE) of each pathway. The mediation model adjusted for participant age and sex. Multigroup analysis was conducted to examine differences in direct and indirect effects across racial/ethnic groups and chi-squared difference test based on the loglikelihood were used to determine statistical significance of these differences.

In all analyses, longitudinal sampling weights which adjust the sample to be representative of sample characteristics at baseline were employed. All analyses were weighted to account for the complex sampling design and clustering of the data and conducted in SAS version 9.4 and MPLUS version 8.4.

3. Results

Table 2 shows the distribution of CAs and the sociodemographic characteristics in the overall sample and by race/ethnicity. The sample comprises mostly of White (68%) men and women who were 37 years of age on average (SE 0.1, Range 33–43) at the time of the Wave 5 (2016–2018) assessment (Table 2). There was a high prevalence of CAs; 71% of participants endorsed at least one of the CAs, most commonly witnessing violence (40%) and experiencing physical abuse in childhood (27%).

There were no differences by race/ethnicity in age or sex. Compared to White and Asian participants, African American and Hispanic participants were less likely to have parents with a college education, more likely to have parents working in the construction/service industry, and on average had a lower household income during childhood. In adulthood, African American and Hispanic participants were less likely to have a college education, be in a professional/managerial occupation, and a household income of ≥$100,000 than White and Asian participants.

3.1. Prevalence of child adversities by race/ethnicity

For childhood adversities, African American and Hispanic participants were more likely to report witnessing/experiencing violence, parental incarceration, and parental death than White participants. African American and Asian participants were more likely to report child neglect than White participants while African American and White participants were more likely to report parental alcohol problems than Asian and Hispanic participants.

3.2. Child SES and child adversities

In multivariable linear regression analyses adjusted for sex, age and race/ethnicity, the CA index increased as the composite measure of childhood SES decreased. The CA index for those in the medium childhood SES group was 0.11 points (95%CI 0.005, 0.22) and for those in the low SES group 0.50 points (95%CI 0.37, 0.63) higher compared to those in the high SES group (Data not shown in tables), an interaction by race/ethnicity was observed (p = 0.008). As the composite measure of childhood SES decreased, the CA index score increases for African American (b = −0.27, 95% CI: −0.44, −0.10) and White (b = −0.37, 95% CI: −0.46, −0.29) participants. No association was noted for Asian and Hispanic participants (Data not shown in tables). Adjusted mean CA scores by tertiles of childhood SES and by race/ethnicity are presented in Fig. 1. We note the CA index decreases as the tertiles of childhood SES increases for African American, Hispanic, and White participants, whereas Asian participants had a higher CA score in the highest tertile of childhood SES (Fig. 1).

3.3. Child adversities and adult SES

In multinomial logistic regression models adjusted for participant's demographics, a dose-response effect was noted in the relation between CAs and adult SES (Fig. 2). As the number of CAs increased, the odds of being of high or medium SES decreased compared to low SES in adulthood and this differed by race/ethnicity (interaction p-value = 0.018). This association was not statistically significant for Asian and Hispanic participants when comparing middle to low adult SES.

3.4. Child SES, child adversity and adult SES

Direct and indirect pathways from the full mediation path analyses are presented in Fig. 3. Differences in direct and indirect effects across racial/ethnic groups were noted based on the chi-squared difference test (p = 0.008) for the path analyses. Estimates of the direct association between childhood SES and CA were noted, for African-American and

Table 2
Weighted prevalence of Study Sample Demographics, Covariates and Childhood Adversity, Add Health Study N = 6844.

Characteristics, mean/% (SE)	Total N = 6844	African American N = 1364	Asian N = 425	Hispanic N = 975	White N = 4080	p-value
Age, (mean)	37.4 (0.1)	37.6 (0.2)	37.7 (0.4)	37.4 (0.2)	37.3 (0.2)	0.36
Sex, Female	50.0 (0.8)	51.2 (2.3)	50.0 (4.7)	49.7 (2.2)	49.7 (1.0)	0.93
Parental Highest Education level						<0.001
Less than high School	12.6 (1.1)	14.7 (2.0)	7.4 (2.6)	32.9 (4.3)	8.6 (0.9)	
High School graduate	31.1 (1.4)	37.1 (3.0)	23.5 (4.6)	30.3 (2.6)	30.3 (1.7)	
Some college	21.6 (0.9)	20.6 (1.9)	16.3 (2.7)	16.5 (2.1)	23.0 (1.0)	
College or graduate education	34.7 (2.0)	27.5 (3.2)	52.8 (5.1)	20.2 (2.9)	38.0 (2.4)	
Parental Occupation						<0.001
Service Industry/ Construction	36.8 (1.6)	47.3 (3.7)	38.1 (5.6)	51.6 (3.7)	31.8 (1.7)	
Technical/ Office Worker	27.8 (1.0)	21.3 (2.0)	31.7 (4.0)	25.7 (2.2)	29.4 (1.1)	
Professional/ Managerial	35.4 (1.7)	31.5 (2.9)	30.2 (3.7)	22.7 (2.8)	38.8 (2.0)	
Household income (mean yearly income/ thousand)						<0.001
Low	16.3 (0.3)	14.3 (0.6)	17.3 (1.6)	16.4 (0.5)	17.1 (0.4)	
Medium	40.4 (0.3)	40.0 (0.6)	40.6 (1.2)	38.3 (0.8)	40.9 (0.3)	
High	86.5 (3.2)	83.6 (7.7)	88.0 (10.3)	94.9 (15.0)	85.9 (3.4)	
Participant Highest Education level						<0.001
Less than high School	5.6 (0.7)	7.5 (1.4)	0.8 (0.5)	10.1 (2.2)	4.6 (0.7)	
High School graduate	20.6 (1.2)	25.7 (2.5)	15.2 (3.0)	23.6 (2.3)	19.1 (1.4)	
Some college	37.7 (1.0)	39.4 (2.2)	34.7 (5.9)	38.5 (2.9)	37.3 (1.3)	
College or graduate education	36.1 (1.8)	27.4 (2.9)	49.2 (5.9)	27.8 (2.9)	39.1 (2.1)	
Participant Occupation						<0.001
Service Industry/ Construction	26.9 (1.2)	31.2 (2.9)	14.9 (4.4)	26.7 (2.3)	26.8 (1.4)	
Technical/ Office Worker	30.4 (1.0)	35.5 (2.8)	26.1 (5.2)	34.2 (2.7)	28.9 (1.1)	
Professional/ Managerial	42.6 (1.4)	33.4 (2.8)	59.0 (5.3)	39.0 (2.5)	44.3 (1.6)	
Household income						<0.001
≤$49,999	30.5 (1.5)	54.9 (2.7)	16.1 (3.9)	31.8 (3.0)	26.0 (1.5)	
$50,000 - $99,999	34.3 (0.9)	28.7 (1.7)	35.5 (4.5)	35.1 (3.2)	35.2 (1.1)	
≥$100,000	35.2 (1.5)	16.4 (2.1)	48.3 (4.8)	33.1 (3.2)	38.8 (1.7)	
Childhood Adversities						
Child Neglect	11.2 (0.6)	15.2 (1.5)	14.7 (2.7)	13.1 (2.0)	9.6 (0.7)	<0.001

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Table 2 (*continued*)

Characteristics, mean/% (SE)	Total N = 6844	African American N = 1364	Asian N = 425	Hispanic N = 975	White N = 4080	p-value
Physical Abuse	27.2 (0.9)	25.7 (1.8)	36.0 (4.8)	30.1 (2.8)	26.5 (1.1)	0.08
Sexual Abuse	4.7 (0.4)	6.7 (1.1)	3.5 (1.9)	5.1 (1.1)	4.2 (0.5)	0.12
Parental Alcohol Abuse	13.6 (0.9)	14.0 (1.3)	6.6 (2.0)	10.1 (1.6)	14.6 (1.2)	0.010
Witnessed/ Experienced Violence	40.4 (1.0)	54.1 (2.2)	35.3 (3.2)	48.3 (2.2)	35.9 (1.2)	<0.001
Parental Incarceration	10.8 (0.7)	16.5 (1.9)	4.2 (1.2)	13.0 (2.0)	9.1 (0.7)	<0.001
Dating Violence	20.4 (1.0)	24.0 (2.0)	14.1 (2.1)	19.3 (2.4)	20.2 (1.2)	0.06
Parental Death	4.8 (0.5)	9.8 (1.4)	5.6 (2.7)	7.1 (1.7)	3.1 (0.4)	<0.001
Homelessness	4.7 (0.4)	4.2 (0.8)	2.6 (1.5)	5.8 (1.5)	4.8 (0.4)	0.49
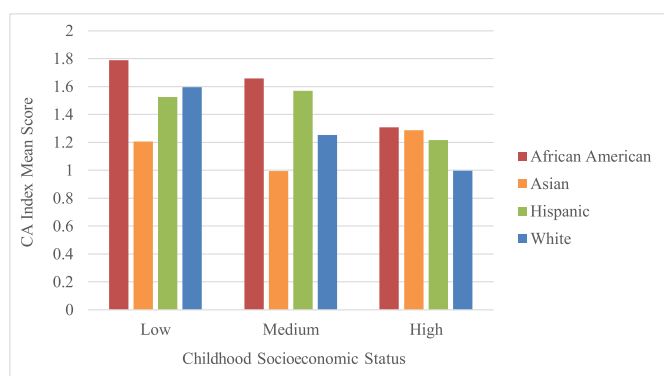
Fig. 1. Childhood adversity (CA) index by childhood socioeconomic status and race/ethnicity, Add Health Study N = 6,844. Childhood SES is a composite measure of parental education, parental occupation and household income. Mean scores adjusted for sex and age. P-value = 0.016 for race/ethnicity by childhood socioeconomic status interaction.
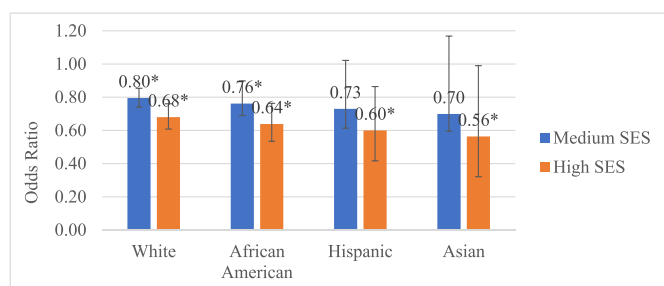

Fig. 2. Multinomial model of the association between CA scores and adult socioeconomic status by race/ethnicity (mean age 37), Add Health Study, N = 6,844. Model adjusted for race/ethnicity, sex, and age. The reference group is low SES. P-value = 0.018 for CA score by race/ethnicity. *p < 0.05.

White participants even after accounting for confounders. Direct associations between CA and adult SES were noted for African-American, Hispanic and White participants. Across racial/ethnic groups, indirect effects were found for African American (p = 0.010) and White participants (p < 0.001), but not for Asian (p = 0.710) or Hispanic participants (p = 0.131), CA mediated 4.1% of the association among African American participants and 5.4% for White participants. A direct effect between child SES and adult SES was observed across all racial and ethnic groups, which given the small proportion mediated was similar in magnitude to the total effect.

4. Discussion

In this nationally representative sample of US high school adolescents, we find a high prevalence of CAs and that CAs are strongly associated with childhood SES. Participants of lower SES endorsed a higher number of CAs. We note a dose-response association of increasing number of CAs and greater odds of lower SES in adulthood. In addition, we observe the relation between child SES and adult SES to be partially mediated by CA even after accounting for age, race/ethnicity and sex. When examining differences by race/ethnicity we note the child SES, CA index and adult SES association differ by race/ethnicity and that CA mediates the relation between child SES and adult SES among African American and White participants but not Asian or Hispanic participants.

Our findings are consistent with the CAs and socioeconomic gradient noted in the BRFSS (Merrick et al., 2018). Traumatic and adverse experiences during childhood, however, are not entirely socioeconomically driven; we did note a high prevalence of CAs even among those in higher SES levels. Accumulation of social risk factors has been noted to occur among both high and low socioeconomic levels, however it is higher among lower socioeconomic populations (Bjorkenstam et al., 2013; Ebrahim et al., 2004). Parental death, witnessing violence or experiencing child abuse can affect children at all socioeconomic levels; however, the likelihood that a child will experience more than one of these experiences increases as socioeconomic status decreases. For example, in a recent study in Sweden, CAs were more prevalent among participants whose parents had a low socioeconomic position (Bjorkenstam et al., 2013). Furthermore, the impact on health outcomes may be differential across SES levels, although few studies have examined how SES may moderate CA and health outcome associations.

Previous work has shown that childhood adversities are associated with adult socioeconomic status, which is consistent with our findings. Using the E-risk cohort of children born in the UK, Jaafee and colleagues noted that a history of child maltreatment, a component of CA, was associated with low educational qualifications or of not being in education, employment, or training at age 18 years (Jaffee et al., 2018). We furthermore note that CAs only partially mediated the relation between child SES and adult SES, albeit the percent mediated was small. These findings suggest that low SES in childhood and CA while significantly associated have largely independent effects on SES in adulthood; the pathways that link childhood SES to adult SES and CA to adult SES may operate under different mechanisms. Consistent with our findings, a study utilizing the Panel Study of Income Dynamics, also demonstrated that while both child household income and CA were associated with adult markers of SES, child household income did not fully account for the CA and adult SES association (Shaefer et al., 2018). Childhood adversities may impact adult SES through several pathways, including poor child behavioral and mental health outcomes, that can impair a child's ability to successfully compete in education. A recent study based on the Rochester Youth Development Study noted child maltreatment to be associated with financial strain in adulthood that was partly mediated by depressive symptomatology and substance abuse (Henry et al., 2018).

We note differences by race/ethnicity, in that indirect effects were noted among White and African American participants but not among Asian or Hispanic participants. Specifically, we only note associations between child SES and CA among African American and White participants. Factors that modify the impact of child SES on CA, including positive factors such as social support or negative factors such as discrimination, may differ across race/ethnicity. These same factors may buffer or exacerbate the impact of CA on adult SES. Alternatively, these race/ethnicity differences could simple be attributed to sample size as Whites and African Americans comprised the largest sample sizes in the study.

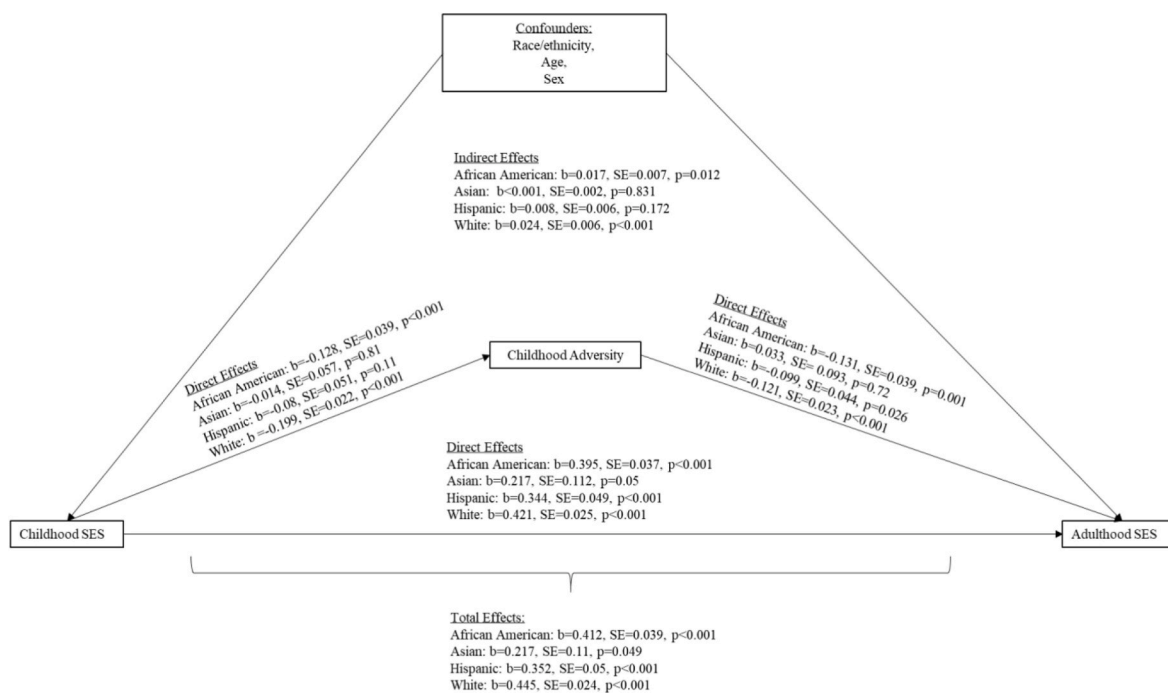There are some limitations worth noting. First, most of the measures

Fig. 3. Direct and Indirect Associations between Childhood Socioeconomic Status, Childhood Adversity and Adult SES, by race/ethnicity Add Health. (n = 6844).

were assessed in adolescence with one measure assessed retrospectively in adulthood. We also lacked information on other measures of childhood adversity, such as parental mental illness, as they were not assessed. However, we improve upon the vast majority of CA studies that rely on retrospectively assessed measures for all CA events since measurement was closer in time to its actual occurrence than solely relying on adult retrospective reports. Second, childhood socioeconomic status was based on parental education, household income and occupational status reported in adolescence. It is plausible that early childhood SES differed from adolescent SES introducing a potential for misclassification of socioeconomic status. However, we utilize a composite measure of childhood SES, measured from three distinct socioeconomic indicators providing a more complete measure of childhood/adolescence socioeconomic status.

Evidence supporting an association between CAs and long-term health and well-being continues to grow. In this nationally representative sample, we note a relation between childhood SES and CAs as well as an association between CAs and adult SES independent of childhood SES. Exploring the pathways by which CAs impact adult SES attainment may provide insights into potential modifiable factors suitable for intervention efforts. As an SES gradient also exists among numerous health outcomes, its plausible that CAs may mediate the role of SES on health and well-being (Baum et al., 1999). Future studies should explore the potential mediating and modifying role of CAs on the SES and health relation. Our study contributes to the existing evidence on the impact of CAs on life-long health and supports the notion that identifying CA, for example through home visiting programs, health services and school referrals and addressing CAs in childhood, for example by promoting positive family functioning and fostering of nurturing home environments, characterized by warmth, safety, support, and empathetic parenting relationships, could improve health and well-being throughout the lifecourse (Britto et al., 2017; Jones et al., 2020).

Ethical statement

The authors declare no conflicts of interest.
This manuscript uses data from the Add Health study. The Add Health Study was approved by the institutional review board of the

University of North Carolina, Chapel Hill. Informed consent of participants was provided in written form. Analyses were approved by the institutional review board of Emory University.

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