Adverse Childhood Experiences and Adolescent Mental Disorders: Protective Mechanisms of Family Functioning, Social Capital, and Civic Engagement

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Abstract

This study aimed to investigate the protective effect of family functioning, social capital, and civic engagement on mental health in adolescents with adverse childhood experiences (ACEs). Parents of adolescents aged 12 to 17 years ($N = 20{,}708$) who participated in the 2015-2016 National Survey of Children's Health were surveyed about their children' ACEs (e.g., parental divorce, being a victim of violence, living with anyone who had substance abuse) and current mental health disorders, including depression, anxiety, and behavioral problems. Parents were further asked about their family functioning, perceived social capital, and adolescents' civic engagement. Structural equation modeling was conducted to test the hypothesized pathways using M*plus* 8.0. Based on parents' report, about 55% of adolescents have experienced at least one kind of ACE. The final structural model proved an excellent fit to the data (CFI = 0.96, RMSEA = 0.009, WRMR = 1.12). A significantly positive relationship was found between adolescents' ACEs and current mental disorders ($\beta = 0.13$, $p < 0.05$), and the effect was partially mediated by family functioning ($\beta = 0.10$, $p < 0.001$) and civic engagement ($\beta = 0.01$, $p < 0.05$), but not by social capital ($\beta = 0.01$, $p = 0.12$). Low household income ($\beta = -0.24$, $p < 0.001$) and low parent education ($\beta = -0.05$, $p < 0.05$) significantly increased adolescents' likelihood of having ACEs. Early assessment and interventions for children with ACEs are necessary to prevent the development of mental disorders in adolescence, especially for minority adolescents and those of low socioeconomic status. Safe, nurturing, and supportive home and social environments can help mitigate the detrimental impact of childhood adversity.

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Mental disorders (e.g., anxiety, depression, behavior/conduct disorders) are prevalent and have severe impacts on health and well-being among adolescents (U.S. Department of Health and Human Services [USDHHS], 1999). Large-scale studies report that up to 21% of adolescents have ever had one or more mental disorders in their lifetime (Costello et al., 2003; Lu, 2017). Without proper treatment/attention, mental disorders can lead to many downstream negative consequences in late adolescence (e.g., academic failure, violence, self-injuries) and adulthood (e.g., lower income level, higher divorce rates, crime) (Brown et al., 2010; Rao & Chen, 2009). Most seriously, the interplay between mental disorders and other factors (e.g., social strains) can result in suicide, which is the second leading cause of death in youths aged 10 to 19 in the United States (Heron, 2016).

Substantial evidence shows that chronic exposure to adverse childhood experiences (ACEs; e.g., abuse, neglect, and violence victimization) can lead to long-term damage to health in adulthood (Brown et al., 2010; Chapman et al., 2004; Downey et al., 2017; Felitti et al., 1998; Schilling, Aseltine, & Gore, 2007). Emerging research has also found cumulative ACEs to be associated with increased risks for anxiety, depression, substance abuse, and behavioral problems

during adolescence (Hunt, Slack, & Berger, 2017; McLaughlin et al., 2010; McLaughlin et al., 2012; Oh et al., 2018; Schilling et al., 2007). Distinct from childhood and adulthood, adolescence is a unique developmental stage during which physiologic, cognitive, social, and emotional changes occur simultaneously (Blakemore & Mills, 2014). As a result, the traumatic effects of ACEs can be particularly salient for the emotional and cognitive development of adolescents as they navigate and adjust to the social environment (Blakemore & Mills, 2014; Soleimanpour, Geierstanger, & Brindis, 2017). It is important, therefore, to identify factors that can offset the impact of ACEs on mental health and protect adolescents exposed to childhood adversity.

Prior research has suggested a number of positive social determinants, as defined in the Healthy People 2020 Social Determinants of Health Framework (USDHHS, 2011), that can bolster individual health and well-being. In particular, family functioning, often measured as positive parent-child communication and low levels of parental stress, is associated with better adolescent health outcomes, higher levels of school engagement, and lower levels of alcohol and substance use (Annunziata et al., 2006; Ferro & Boyle, 2015; Sheidow et al., 2014). Social capital, succinctly defined as the social connectedness of a community, appears to have direct impact on individual mental health and can buffer the effects of neighborhood disadvantage on health (Fone et al., 2007; Murayama, Fujiwara, & Kawachi, 2012; Wakefield & Poland, 2005). Also, civic engagement, including community service, volunteering, and participation in organized activities, has been increasingly recognized as a crucial component of youth development that can lead to reduced risky health behavior, increased success in school, and enhanced daily well-being among adolescents (Fredricks & Eccles, 2010; Hooker & Brand, 2009; Wray-Lake et al., 2017)**.** Little is known, however, about the potential protective mechanisms of the three critical social determinants against the damaging effects of ACEs on adolescent mental health.

This study aims to address these research gaps using a large, population-based sample of adolescents aged 12 to 17 in the 2016 National Survey of Children's Health (NSCH). The NSCH is a national survey with rich data on multiple, intersecting aspects of children's health and well-being, access to and quality of health care, and the child's family, neighborhood, school, and social contexts. Specifically, this study aims to: 1) examine the relationship between ACEs and adolescent mental disorders, including anxiety, depression, and behavior/conduct problems; and 2) investigate the protective effects of family functioning, social capital, and civic engagement on mental health among adolescents with childhood adversity. Some sociodemographic factors (e.g., gender, race, poverty) appear to predispose an individual to adversity in childhood and mental disorders in adolescence. Therefore, we further assessed the moderating effect of these factors on the pathways from ACEs to adolescent mental disorders.

As illustrated in our conceptual model (Figure 1), we hypothesized that: 1) there would be a direct (and positive) relationship between ACEs and adolescent current mental disorders; 2) family functioning, social capital, and civic engagement would be negatively associated with mental disorders and would mediate the relationship between ACEs and mental disorders; and 3) significant sociodemographic differences would be observed in ACEs, adolescent mental disorders, family functioning, social capital, and civic engagement.

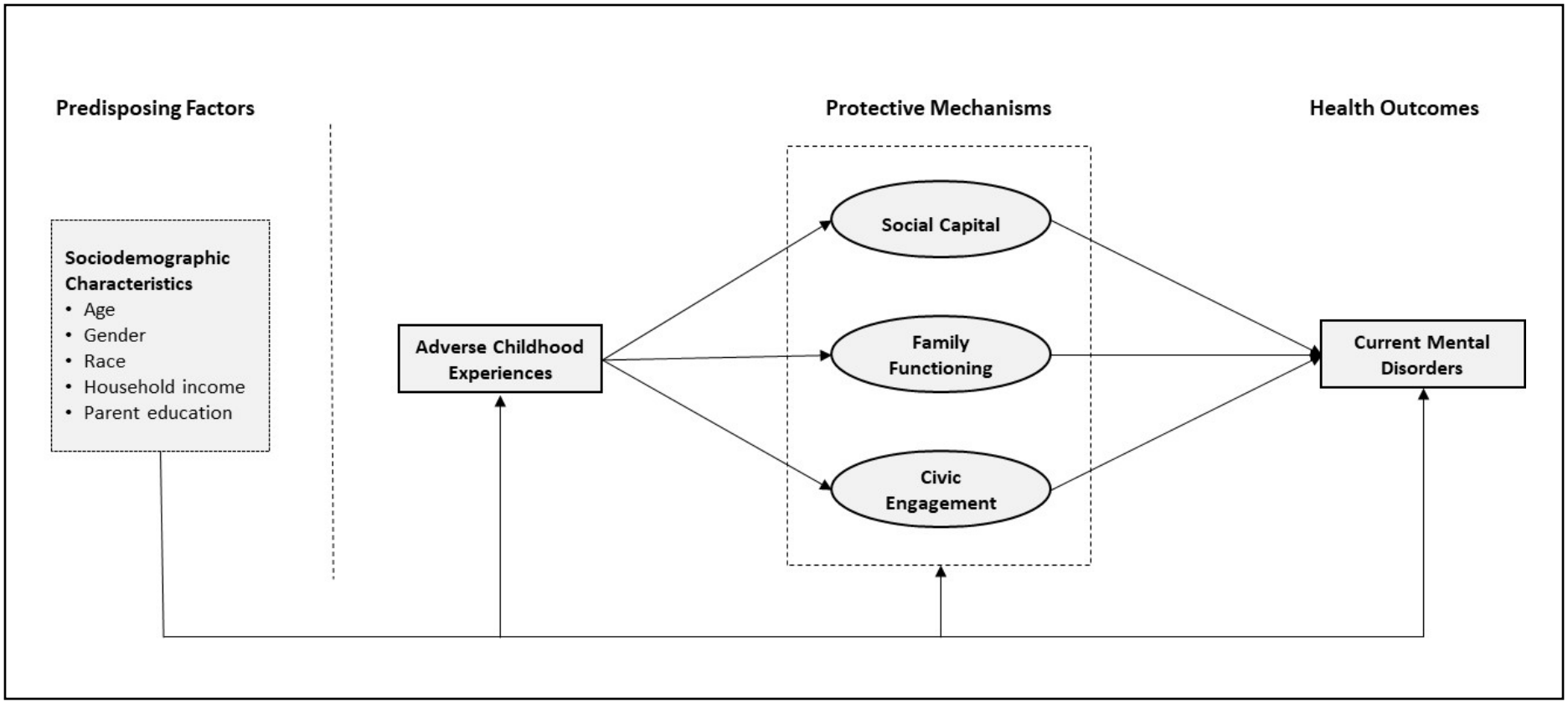

Figure 1. Conceptual model for the pathways from adverse childhood experiences to adolescent current mental disorders.

Methods

Sampling

Conducted by the U.S. Census Bureau, the 2016 NSCH randomly sampled civilian, non-institutionalized households with one or more children under 18 years of age from the 50 states and the District of Columbia. To increase sampling efficiency, administrative records from multiple sources were also utilized to match a list of child identifiers to residential addresses.

Only one child from each household was randomly selected as the subject of the interview, and the parent or guardian "who knows the most about the health and health care of the child" served as the survey respondent. The 2016 NSCH was administered in both English and Spanish. In total, 139,923 households were screened for age-eligible children, and completed data were obtained from parents of 50,121 children aged 0-17 years, with a weighted overall response rate of 40.7%. On average, approximately 985 surveys were collected per state (state range: 638 to 1,351).

To obtain population-based estimates, each selected child for whom an interview was completed was assigned a weight. The child's weight was composed of a base sampling weight, adjustments for non-response and within-household subsampling procedures, and adjustments used to control population counts for various demographics obtained from the 2015 American Community Survey data. For the purpose of this study, we restricted our sample to adolescents aged 12-17 years. More detailed information about the design, sampling, and weighting procedures of the 2016 NSCH is available at http://childhealthdata.org/learn/NSCH.

Measures

Predisposing Factors. Five sociodemographic factors from the 2016 NSCH were examined in this study, including adolescents' gender, age, race/ethnicity, annual household income, and parent educational level. Specifically, adolescents were categorized into three age groups: early adolescence (ages 12 to 13), middle adolescence (ages 14 to 15), and late adolescence (ages 16 to 17). Race/ethnicity was classified as non-Hispanic White, Hispanic, non-Hispanic Black, Asian, and other/multi-racial. Annual household income was calculated based on the relative ranking below or above the Federal Poverty Threshold (FPT) based on family size and income at the time of the survey. Highest educational level of the adult respondent was composed of three categories: high school/ General Educational Development (GED) or below, some college or technical school, and college degree or higher.

ACEs. In the 2016 NSCH, parents were asked whether or not their children have experienced any of the following nine adverse experiences in childhood: 1) hard to get by on family's income; 2) parent or guardian divorced or separated; 3) parent or guardian died; 4) parent or guardian served time in jail; 5) saw or heard parents or adults slap, hit, kick punch one another in the home; 6) was a victim of violence or witnessed violence in neighborhood; 7) lived with anyone who was mentally ill, suicidal, or severely depressed; 8) lived with anyone who had a problem with alcohol or drugs; and 9) treated or judged unfairly due to race/ethnicity. Adolescents were coded as having ACEs if their parents responded "yes" to one or more of the nine items. These questions were derived from a modified version of the Centers for Disease Control (CDC) and Kaiser Permanente Adverse Childhood Experiences Study (Duke et al., 2010).

Mediators: Family Functioning, Social Capital, and Civic engagement. Family functioning was collectively measured by four items: family communication, parental coping, family resilience, and parental aggravation. For family communication and parental coping, parents were asked to indicate: 1) how well they and the child can share ideas or talk about things that really matter; and 2) how well they thought they were handling the day-to-day demands of raising children on a 4-point Likert scale ranging from "not at all" to "very well."

As a composite measure, family resilience was measured by parents' responses to how often they were likely to do the following things when their family faces problems: 1) talk together about what to do; 2) work together to solve our problems; 3) know we have strengths to draw on; and 4) stay hopeful even in difficult times. Response options included "all of the time", "most of the time", "some of the time", and "none of the time." Parental aggravation contained three items derived from the Parental Stress Index (Abidin, 1983) and the Parental Attitudes about Childbearing Scale (Easterbrooks & Goldberg, 1984). Parents were asked to indicate how often: 1) they felt that their child was much harder to care for than other children; 2) they were bothered a lot their child's behavior; and 3) they felt angry with their child in the past month. Responses included "never", "rarely", "sometimes", and "usually or always." To be consistent with positive wording of other constructs, responses for parental aggravation items were reverse coded in the data analysis.

As a latent construct, social capital was composed of two constructs in the 2016 NSCH: neighborhood cohesion and community safety (Balsano, 2005). Neighborhood cohesion was derived from parents' responses to three statements: 1) people in my neighborhood help each other out; 2) we watch out for each other's children in this neighborhood; and 3) when we encounter difficulties, we know where to go for help in our community. The response format included a 4-point Likert scale ranging from "definitely disagree" to "definitely agree." Community safety was measured by parents' responses as to if they agreed or disagreed that 1) the child lived in a safe neighborhood; and 2) the child was safe at school (0 = No, 1 = Yes).

Civic engagement was represented by two items: community service and out-of-school activities. For community service, parents were asked if their child had participated in any type of community service or volunteer work at school, church, or in the community during the past 12 months. For out-of-school activities, parents were asked if their child participated in: 1) a sports team or sports lesson after school or on weekends, 2) any clubs or organizations after school or on weekends, and 3) any other organized activities or lessons, such as music, dance, language, or other arts (0 = No, 1 = Yes).

Current Mental Disorders. Parents were asked whether a doctor or other health care providers had ever told them that their child had depression, anxiety problems, or behavior or conduct problems. Parents who answered "yes" were further asked whether the children currently had the condition(s). Collectively, adolescents were considered as having any current mental disorder if their parents reported that they had depression, anxiety, or a behavior/conduct disorder at the time of the survey.

Statistical Analysis

Before hypothesis testing, descriptive statistics were used to characterize the adolescent sample in this study. Pearson's $\chi 2$ test was conducted to test for sociodemographic differences in adolescents' ACEs and the current prevalence of anxiety, depression, and behavior/conduct problems. For all variables, responses of "don't know" and "refuse to answer" were coded as

missing data. Records with missing data on the variables of interest were excluded from all analyses, except for the family poverty threshold ratio, which was multiply imputed to avoid biased estimation because of its high percentage of missing values (18.56% of the sample and 22.83% of the weighted sample) (U.S. Department of Commerce, 2018).

Following that, structural equation modeling was conducted to test the hypothesized pathways in two steps using M*plus* 8.0. In step 1, measurement models were built and evaluated to confirm the factor structure of the latent variables using confirmatory factor analysis. The mean and variance-adjusted WLS (WLSMV), a more generalized weighted least square based robust estimator, was used for testing measurement models (Kline, 2015). WLSMV is available in M*plus* and can be applied to a combination of binary, ordered categorical, and continuous indicators (Kline, 2015; Yu, 2002). In step 2, multilevel complex modeling was performed to test the hypothesized pathways, adjusting for sampling weights and the complex survey design.

The WLSMV estimator is preferable to maximum likelihood (ML) when data are ordinal and nonnormally distributed (Beauducel & Herzberg, 2006; Flora & Curran, 2004). Model fit was evaluated based on the following fit indices: the Bentler comparative fit index (CFI), the Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA) and its 90% confidence interval, and the weighted root mean square residual (WRMR). To improve model fit, the models were respecified based on modification indices. Item-to-factor loadings, factor correlations, and path coefficients for the measurement and structural models were inspected for sign and/or for magnitude. By default, data containing missing values are deleted listwise when modeling binary outcome using WLSMV estimator in *Mplus* (Muthén & Muthén, 2017).

Results

Sample Characteristics

A total of 20,708 adolescents aged 12-17 years were surveyed in the NSCH 2016. As listed in Table 1, 48.9% were females; 32.9% were aged 12 to 13, 33.8% were aged 14 to 15, 33.3% were aged 16 to 17; and around half were racial/ethnic minorities. The annual household income was <100% of the federal poverty threshold in 21.1% of the households, and 30.5% of adolescents had parents with high school/GED degree or below.

Sociodemographic Differences in ACEs and Mental Disorders

Table 2 lists the proportions of adolescents with ACEs and current mental disorders, stratified by their gender, age, race/ethnicity, household income, and parent education. Based on parental report, 54.6% of adolescents had at least one ACE, and 17.1% had any kind of mental disorder at the time of survey, including anxiety (12.3%), depression (6.8%), and behavior/conduct problems (7.3%), respectively.

Bivariate analysis suggested significant racial/ethnic differences in adolescents with ACEs. For example, compared with whites (52.2%), blacks (71.8%) were more likely to be reported as having experienced at least one ACE (OR = 2.23, $p < 0.001$), whereas a much lower percentage was observed for Asians (36.3%, OR = 0.52, $p < 0.001$). Adolescents from higher income families were less likely to have ACEs than those with household incomes below the poverty line. Further, compared with those whose parents had a high school education or lower (66%),

Table 1

Sociodemographic Characteristics of U.S. Adolescents aged 12 to 17 in the National Survey of Children's Health (NSCH), 2016 (N = 20,708)

Sociodemographic Characteristic	*Category*	*Weighted%*[a]
Gender	Female	48.9
	Male	51.1
Age	12-13	32.9
	14-15	33.8
	16-17	33.3
Race/ethnicity	White	53.2
	Hispanic	23.5
	Black	13.7
	Asia	4.2
	Other/multi-racial	5.4
% of Federal Poverty Threshold	<100	21.1
	100-199	21.4
	200-399	26.3
	≥400	31.2
Parent education	≤High school or GED	30.5
	Some college	22.4
	College or higher	43.3

[a] Adjusted for sampling weights and the complex survey design.

adolescents of parents with a college degree or higher were much less likely to have experienced ACEs (43%, OR = 0.38, $p < 0.001$).

Adolescents' gender, age, and race/ethnicity significantly predicted their anxiety. Specifically, males (9.1%) were less likely to have anxiety than females (11.9%, OR = 0.74, $p < 0.001$). Compared with those aged 12 to 13 (8.6%), adolescents in the 14- to 15-year (11.2%, OR = 1.35, $p < 0.01$) and 16- to 17-year age groups (11.5%, OR = 1.39, $p < 0.01$) were more likely to be reported as having anxiety. Further, 13.0% of white adolescents were reported as having anxiety, followed by Hispanics (8.8%, OR = 0.64, $p < 0.001$), blacks (5.8%, OR = 0.41, $p < 0.001$), and Asians (2.6%, OR = 0.18, $p < 0.001$).

Similarly, fewer males (5.2%) were reported as having depression than females (7.1%, OR = 0.72, $p < 0.01$). Compared with those aged 12 to 13 (4.06%), adolescents in the 14- to 15-year (6.1%, OR = 1.56, $p < 0.01$) and 16- to 17-year age groups (8.2%, OR = 2.15, $p < 0.001$) were more likely to be reported as having depression. Compared with whites (6.6%), fewer Hispanics (4.6%, OR = 0.68, $p < 0.05$) and Asians (1.6%, OR = 0.23, $p < 0.001$) experienced depression. Adolescents from higher income families were less likely to have depression than those with household incomes below the poverty line. Further, compared with those of parents with a high school degree or lower (7.2%), adolescents of parents with a college degree or higher were much less likely to be reported having depression (4.7%, OR = 0.63, $p < 0.001$).

In regard to behavior/conduct problems, higher rates were observed among males (9.8%) than females (5.0%, OR = 2.04, $p < 0.001$). Compared with adolescents aged 12-13 years (9.1%),

Table 2

Univariate Sociodemographic Differences in the Weighted Proportions of Adverse Childhood Experiences (ACEs) and Current Mental Disorders among U.S. Adolescents Ages 12 to 17 Years (N = 20,708)

Demographic Characteristics	*ACEs*		*Anxiety*		*Depression*		*Behavior/Conduct Problems*	
	%	OR (95% CI)	%	OR (95% CI)	%	OR (95% CI)	%	OR (95% CI)
Gender								
Female *(Ref.)*	55.3		11.9		7.1		5.0	
Male	56.1	1.04 (0.91,1.17)	9.1	0.74 (0.62, 0.88) ***	5.2	0.72 (0.57, 0.90) **	9.8	2.04 (1.61, 2.60) ***
Age								
12-13 *(Ref.)*	52.1		8.6		4.0		9.1	
14-15	56.3	1.18 (1.01, 1.37) *	11.2	1.35 (1.09, 1.69) **	6.1	1.56 (1.15, 2.11) **	8.0	0.87 (0.67, 1.13)
16-17	58.6	1.30 (1.11, 1.52) ***	11.5	1.39 (1.11, 1.75) **	8.2	2.15 (1.58, 2.91) ***	5.4	0.57 (0.44, 0.73) ***
Race/ethnicity								
White *(Ref.)*	52.2		13.0		6.6		7.4	
Hispanic	55.9	1.16 (0.95, 1.42)	8.8	0.64 (0.48, 0.86) **	4.6	0.68 (0.47, 0.98) *	6.8	0.92 (0.64, 1.31)
Black	71.8	2.32 (1.90, 2.85) ***	5.8	0.41 (0.29, 0.58) ***	7.0	1.06 (0.75, 1.50)	10.6	1.49 (1.11, 2.00) **
Asian	36.3	0.52 (0.36, 0.76) ***	2.6	0.18 (0.11, 0.30) ***	1.6	0.23 (0.13, 0.42) ***	2.2	0.07 (0.05, 0.09) ***
Other	64.0	1.63 (1.31, 2.02) ***	10.5	0.79 (0.60, 1.03)	8.5	1.31 (0.92, 1.86)	7.6	1.03 (0.75, 1.42)
% of FPT								
<100 *(Ref.)*	74.2		11.2		9.1		10.7	
100-199	65.7	0.67 (0.50, 0.88) **	10.1	0.90 (0.65, 1.23)	6.4	0.69 (0.48, 0.99) *	7.8	0.71 (0.51, 0.98) *
200-399	55.9	0.44 (0.34, 0.56) ***	9.5	0.84 (0.64, 1.10)	5.4	0.57 (0.42, 0.78) ***	6.7	0.60 (0.43, 0.84) **
≥400	36.5	0.20 (0.16, 0.25) ***	11.0	0.99 (0.77, 1.27)	4.5	0.47 (0.36, 0.63) ***	5.8	0.51 (0.39, 0.67) ***
Parent education								
≤High school/GED *(Ref.)*	66		10.4		7.2		9.0	
Some college	67	1.03 (0.84, 1.27)	11.7	1.14 (0.87, 1.50)	7.5	1.04 (0.76, 1.41)	8.1	0.90 (0.66, 1.22)
College or higher	43	0.38 (0.32, 0.46) ***	10.0	0.96 (0.76, 1.21)	4.7	0.63 (0.48, 0.84) ***	5.7	0.62 (0.48, 0.80) ***

Note: * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$. Ref: reference group.

fewer adolescents in the 16- to 17-year age groups (5.4%, OR = 0.57, $p < 0.001$) experienced behavior/conduct problems. Compared with whites (7.4%), more blacks were reported as having behavior/conduct problems (10.6%, OR = 1.49, $p < 0.01$), whereas a much lower percentage was observed among Asians (2.2%, OR = 0.07, $p < 0.001$). Adolescents from higher income families were less likely to have behavior/conduct problems than those with household incomes below the poverty line. Further, compared with those of parents with a high school degree or lower (9.0%), adolescents of parents with a college degree or higher were much less likely to have behavior/conduct problems (5.7%, OR = 0.62, $p < 0.001$).

Measurement and Structural Models

Measurement models were assessed to confirm the factor structures of all latent constructs. Table 3 lists the coding schemes, descriptive statistics, and standardized item-to-factor loadings for all variables under respective constructs. Based on the confirmatory factor analysis, all variables showed strong factor loadings (above 0.30) and statistically significant relationships ($p < .001$) with individual latent factors.

Figure 2 displays the final structural model, which proved an excellent fit to the data (CFI = 0.96, TLI = 0.94, RMSEA = 0.009, WRMR = 1.12). As hypothesized, the relationship between adolescents' ACEs and current mental disorders was significant and positive ($\beta = 0.13$, $p < 0.05$). Compared with adolescents without any ACEs, adolescents who experienced at least one kind of adverse experience in childhood were more likely to be reported as having mental disorders at the time of survey. Family functioning ($\beta = -0.38$, $p < 0.001$) and civic engagement ($\beta = -0.10$, $p < 0.01$) directly predicted adolescents' mental disorders, but there was no direct relationship between social capital and mental disorders.

We further tested whether the relationship between adolescents' ACEs and current mental disorders was mediated by social capital, family functioning, and civic engagement. Based on parental report, a significant direct relationship was observed between adolescents' ACEs and social capital ($\beta = -0.20$, $p < 0.001$), family functioning ($\beta = -0.268$, $p < 0.001$), and civic engagement ($\beta = -0.14$, $p < 0.01$), respectively. The total effect of ACEs and adolescents' current mental disorders ($\beta = 0.25$, $p < 0.001$) was partially mediated by family functioning ($\beta = 0.10$, $p < 0.001$) and civic engagement ($\beta = 0.01$, $p < 0.05$), but not social capital ($\beta = 0.01$, $p = 0.12$). Further, significant correlations were observed among the three mediators: social capital and family functioning ($\beta = 0.36$, $p < 0.001$), social capital and civic engagement ($\beta = 0.12$, $p < 0.001$), and family functioning and civic engagement ($\beta = 0.36$, $p < 0.001$) (Figure 2).

As displayed in Figure 2, several sociodemographic characteristics predicted adolescents' ACEs and/or influenced the pathways from ACEs to mental disorders. Specifically, age ($\beta = 0.07$, $p < 0.05$), household income ($\beta = -0.24$, $p < 0.001$), and parent education ($\beta = -0.05$, $p < 0.05$) remained significant predictors of adolescents' ACEs in the final model. Race ($\beta = -0.17$, $p < 0.001$), household income ($\beta = 0.15$, $p < 0.001$), and parent education level ($\beta = 0.14$, $p < 0.001$) significantly influenced the likelihood that adolescents lived in neighborhoods with strong social capital. While minority adolescents were less likely than whites to live in well-functioning families ($\beta = -0.06$, $p < 0.01$), a positive relationship was noted between parent education level and family functioning ($\beta = 0.06$, $p < 0.05$). Household income ($\beta = 0.16$, $p < 0.001$) and parent education level ($\beta = 0.37$, $p < 0.001$) further increased adolescents' civic engagement, whereas less involvement in community services and out-of-school activities was

Table 3

Descriptive Statistics for Variables and Standardized Item-to-factor Correlations for Latent Constructs in the Structural Model (N = 20,708)

Construct	*Observed Variables*	*Coding Scheme and Descriptive Statistics*	*Factor Loading*
Adverse Childhood Experiences (ACEs)	*Whether or not the child had the following experience:*		
	• hard to get by on family's income	0: 71.5% *(No)*; 1: 25.8% *(Yes)*	
	• parent or guardian divorced or separated	0: 63.3% *(No)*; 1: 32.9% *(Yes)*	
	• parent or guardian died	0: 90.4% *(No)*; 1: 5.6% *(Yes)*	
	• parent or guardian served time in jail	0: 85.9% *(No)*; 1: 10.2% *(Yes)*	N/A
	• saw or heard parents or adults slap, hit, kick punch one another in the home	0: 88.1% *(No)*; 1: 7.6% *(Yes)*	
	• was a victim of violence or witnessed violence in neighborhood	0: 89.6% *(No)*; 1: 6.2% *(Yes)*	
	• lived with anyone who was mentally ill, suicidal, or severely depressed	0: 85.5% *(No)*; 1: 9.8% *(Yes)*	
	• lived with anyone who had a problem with alcohol or drugs	0: 83.6% *(No)*; 1: 12.2% *(Yes)*	
	• treated or judged unfairly due to race/ethnicity	0: 90.5% *(No)*; 1: 5.4% *(Yes)*	
Social Capital	*To what extent do you agree that*	*"Definitely disagree" to "Definitely agree"*	
Neighborhood cohesion			
	• People in this neighborhood help each other out.	1: 5.4%; 2: 9.7%; 3: 47.1%; 4: 34.8%	0.66 (0.02) ***
	• We watch out for each other's children in this neighborhood.	1: 6.2%; 2: 9.1%; 3: 39.3%; 4: 42.4%	0.69 (0.01) ***
	• When we encounter difficulties, we know where to go for help in our community.	1: 6.0%; 2: 8.8%; 3: 34.6%; 4: 47.4%	0.74 (0.01) ***
Community safety	Does this child live in a safe neighborhood?	0: 5.2% *(No)*; 1: 91.8% (*Yes*)	0.67 (0.01) ***
	Is this child safe at school?	0: 2.8% *(No)*; 1: 92.5% *(Yes)*	0.50 (0.01) ***

Table 3 (continued)

Descriptive Statistics for Variables and Standardized Item-to-factor Correlations for Latent Constructs in the Structural Model (N = 20,708)

Construct	*Observed Variables*	*Coding Scheme and Descriptive Statistics*	*Factor Loading*
Family Functioning			
Family communication	How well can you and this child share ideas or talk about things that really matter?	*"Not at all"* to "*Very well"* 1: 0.8%; 2: 4.6%; 3: 30.5%; 4: 61.0%	0.57 (0.02) ***
Parental coping	How well do you think you are handling the day-to-day demands of raising children?	*Not at all* to *Very well* 1: 0.1%; 2: 1.3%; 3: 32.0%; 4: 64.8%	0.56 (0.02) ***
Family resilience	When your family faces problems, how often are you likely to • talk together about what to do? • work together to solve our problems? • know we have strengths to draw on? • stay hopeful even in difficult times?	Parents who responded "*all or most of the time*" to 0-1 items (1: 11.8%); 2-3 items (2: 15.2%); or 4 items (3: 71.0%).	0.56 (0.02) ***
Parental aggravation	During the past month, how often have you felt: • this child is much harder to care for than most children his or her age? • this child does things that really bother you a lot? • angry with this child?	Parents who "*usually or always*" (1: 6.3%) vs. "*rarely or never*" (2: 92.2%) feel aggravated by parenting for any of the 3 items.	0.36 (0.04) ***
Civic Engagement			
Community service	During the past 12 months, did this child participate in any type of community service or volunteer work at school, church, or in the community?	0: 43.9% *(No)*; 1: 52.2% *(Yes)*	0.54 (0.08) ***
Out-of-school activities	During the past 12 months, did this child participate in • a sports team or did he or she take sports lessons after school or on weekends? • any clubs or organizations after school or on weekends? • any other organized activities or lessons, such as music, dance, language, or other arts?	Children who "*participate*" (1: 79.6%) vs. "*not participate*" (0: 17.9%) in one or more of the 3 out-of-school activities.	0.61 (0.04) ***

Note. *** $p \leq 0.001$.

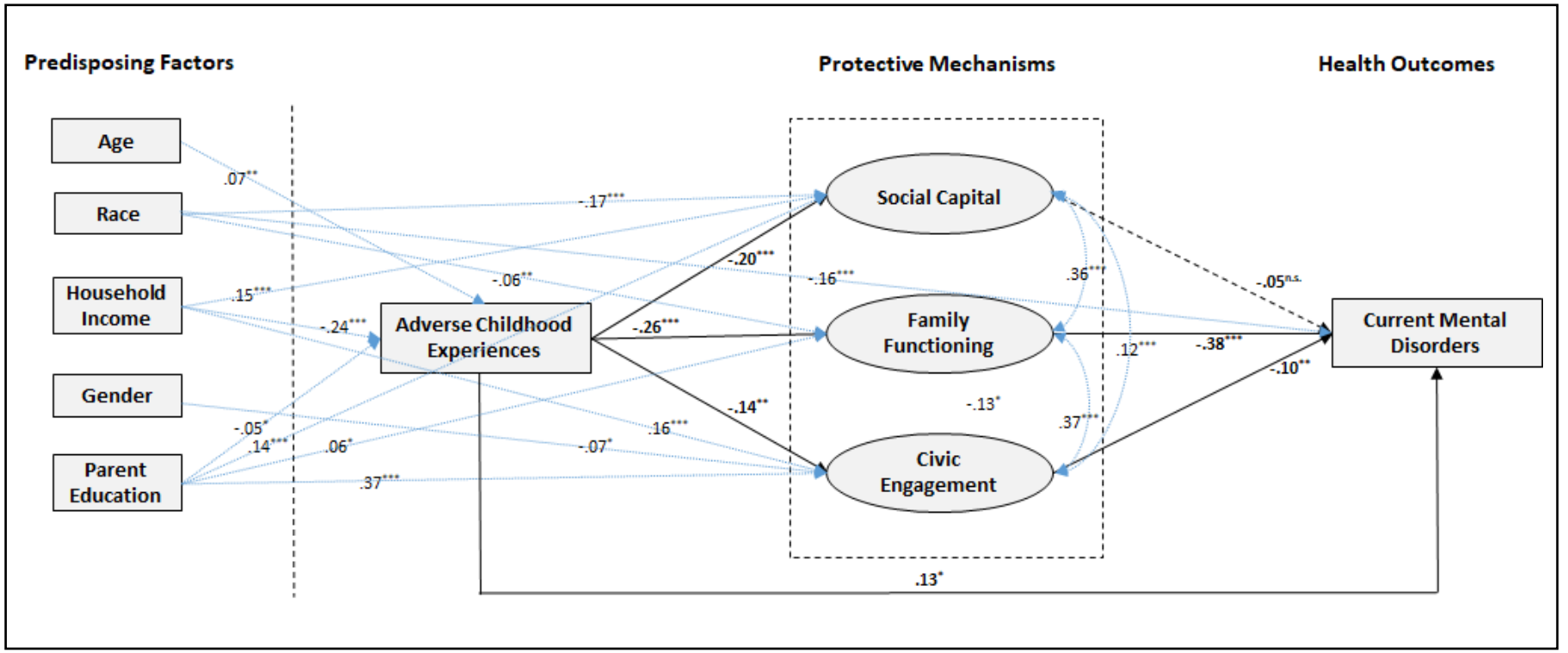

Figure 2. Structural model for the pathways from adverse childhood experiences to adolescent current mental disorders. Parameter estimates are standardized regression weights. A regression weight with a positive sign means the expected value of the dependent variable (e.g., current mental disorders) is increased when the predictor value increases. Model fit statistics: CFI = 0.96; TLI = 0.94; RMSEA = 0.009; WRMR = 1.12. $^{*}p \leq 0.05$, $^{**}p \leq 0.01$, $^{***}p \leq 0.001$, n.s. = not significant.

noted among males than females ($\beta = -0.07$, $p < 0.05$). Lastly, compared with whites, minority adolescents less likely to be reported as having current mental disorders ($\beta = -0.16$, $p < 0.001$).

Discussion

Using a large population-based sample, this study examined the prevalence of ACEs among U.S. adolescents, confirmed the determinant role of ACEs in adolescent mental disorders, and suggested multiple strategies that can be incorporated into family and community level initiatives to ameliorate the damaging impact of ACEs.

Based on parental report, about 55% of adolescents aged 12-17 in the United States experienced at least one kind of ACE in their childhood, and the risk was higher among adolescents with less educated parents and those from low-income families, which was consistent with findings from a recent national urban birth cohort study (Hunt et al., 2017). The alarmingly high prevalence of ACEs seemingly necessitates early assessment and screening for adolescents with ACEs, especially those in low SES families. It is critical to note, however, that the screening tools for ACEs are still in very early stages of development and evaluation, and the quality of many instruments remains elusive (Bailhache et al., 2013; Milne & Collin-Vézina, 2015; Tonmyr et al., 2011). In particular, there are substantial debates and controversies as to what adversities should be assessed (e.g., bullying, peer rejections, discrimination, stress symptoms, maltreatment, social welfare deficits) in different populations (e.g., older adolescents, racial/ethnic minorities), and whether assessment should be focused on parents or children, or both (Finkelhor, 2017; Finkelhor, et al., 2015; Nygren, Nelson, & Klein, 2004). There is also confusion about how ACE measurement differs from other social determinants of health, such as poverty and family structure (Bethell et al., 2017). Apparently, before starting widespread assessment, more sophisticated empirical research is warranted to develop, refine, and validate screening tools for ACEs among adolescents.

The significant relationship between ACEs and adolescent mental disorders highlights the importance of early intervention strategies, especially initiatives at the family and community levels. Previous studies have confirmed the effectiveness of many family support programs in improving adolescent mental and behavioral health (Kuhn & Laird, 2014; Woods-Jaeger et al., 2018). Yet, few of these programs focused on adolescents with traumatic childhood experiences (Kuhn & Laird, 2014). The strong mediating effect of family functioning identified in this study provides critical insights as to strategies that can be incorporated into existing family support programs to reduce the risk of negative adolescent mental health outcomes associated with ACEs. Specifically, health education support is needed to raise parents' awareness of the negative consequences of ACEs, teach them how to communicate effectively with their adolescents, improve their parenting skills, and engage in stress management practices. Given that adolescents of racial/ethnic minorities and less educated parents are more likely to experience family dysfunction, as noted in this study, these instructional efforts will be particularly beneficial to the marginalized families.

As hypothesized, civic engagement mediated the relationship between ACEs and adolescent mental disorders, which underscores the value of community level initiatives that promote positive experiences for adolescents. Community volunteer services and out-of-school activities often offer the opportunity for participation and leadership. Through social interaction and mutual assistance (Bruner, 2017), these community-based initiatives help foster individual resilience and hold the potential to mitigate the damaging effect of ACEs on adolescent mental

health. Based on findings from this study, adolescents from low-income families and those with less educated parents were less likely to participate in community services and out-of-school activities. Previous studies have suggested that civic opportunities are more common for advantaged students in well-resourced communities, whereas poor neighborhoods are often racially segregated and distant from sources of civic engagement (Balsano, 2005). To address these severe disparities, we need more government support and strengthened programming to expand opportunities for adolescents living in "civic deserts."

Contrary to our hypothesis, there was no direct relationship between social capital and adolescent mental disorders. Yet, the strong associations of social capital with family functioning and civic engagement suggest that the relationship between social capital and adolescent mental health may be indirect and operate through family processes and community engagement activities, which validates multiple theories of how contextual and social environments may influence children's health, including the social ecological model (Bronfenbrenner, 1979; McLeroy et al., 1988), the collective socialization model (Sampson, Raudenbush, & Earls, 1997), and the environmental stress model (Burnaford, 1997). To further clarify the role of social capital on the pathways from ACEs to adolescent mental disorders, more empirical studies are needed. Furthermore, as revealed in this study, minority adolescents, adolescents with less educated parents, and those from low-income families were less likely to live in neighborhoods with strong social capital. When designing health-promoting interventions for children and families, public health professionals and urban planners should pay particular attention to facilities and activities that can help foster social capital in those low-income neighborhoods and ethnic enclaves.

Several limitations of this study need to be noted. First, only parents were surveyed in this study, which may have introduced response bias. It is possible that parents under-reported their socially undesirable behaviors (e.g., parental incarceration, drug abuse) or failed to recognize their children's mental disorders. Research examining parent-child agreement has further shown that adolescents are better at reflecting on their own experiences and identifying family functioning problems (Bögels & van Melick, 2004; Skinner, Steinhauer, & Sitarenios, 2000; Skinner, Steinhauer, & Santa-Barbara, 1983), while parents tend to be more sensitive to neighborhood problems and threats (Brownson et al., 2009; Timperio et al., 2004). In order for more comprehensive understanding, future surveys with both parents and adolescents are warranted. Second, the study is cross-sectional in nature and does not offer causal inferences. To further confirm the relationship between ACEs and adolescent mental disorders and how various family, community, and social experiences mediate the relationship, longitudinal panel studies are essential. Third, the good fit of our SEM model does not necessarily mean the model is valid. We call for more studies to test and establish the validity of our model, or other models to test our hypotheses. Further, the measurement of the mediators in this study was relatively simplistic and incomplete. For example, only two constructs were used to measure civic engagement (i.e., community services and out-of-school activities), which was far from being exhaustive. There is also ongoing debate as to how the multidimensional and often ambiguous concept of social capital should be conceptualized, defined, and measured (Wakefield & Poland, 2005), especially in adolescent populations.

Despite these caveats, the NSCH is the only national sample of adolescents in the United States to examine the prevalence of a full range of adverse childhood events combined with aspects of family, community, and social influences, and provide us with important information on links to adolescent mental and behavioral health. Our research provides substantial

contributions to the existing ACE literature by identifying protective mechanisms on the pathways from childhood adversity to adolescent mental disorders. By clarifying these relationships, effective family and community level interventions can be developed to ameliorate the damaging impact of adversity and positively alter the life course trajectory of adolescents, especially for minority adolescents in disadvantaged families.

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