



The shadow of context: Neighborhood and school socioeconomic disadvantage, perceived social integration, and the mental and behavioral health of adolescents

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ABSTRACT

The number of youths who experience mental distress has been increasing over the past years. Adolescents with mental health problems also show high rates of co-occurring substance-related behaviors such as illicit drug use. This study leverages large-scale and nationally representative Add Health data to evaluate whether the risks conferred by neighborhood and school socioeconomic disadvantages adversely impact adolescents' mental and behavioral health (i.e., depressive symptoms and illicit drug use). We further investigate whether levels of perceived social support from friends, parents, and teachers moderate the associations between contextual disadvantages and adolescents' mental and behavioral outcomes. Results from cross-classified multilevel modeling analysis suggest that neighborhood socioeconomic disadvantages, and to a lesser degree, school socioeconomic disadvantages, uniquely and simultaneously predict mental and behavioral outcomes of adolescents. Although social support is likely to offset the mental and behavioral consequences of disadvantaged social context to all, high levels of social support is most protective for adolescents of least disadvantaged neighborhoods. This study highlights the possibility that structural disadvantage—within both the school and neighborhood contexts—may adversely impact adolescents' mental well-being and increase their risk for illicit drug use.

1. Introduction

Mental health problems and substance-related risky behaviors are common among adolescents and young adults (Mojtabai et al., 2016; Twenge et al., 2019). Adolescents with mental health problems also show high rates of co-occurring substance-related behaviors such as illicit drug use (Kelly and Daley, 2013; Ross and Peselow, 2012). The strong connection between substance use and mental problems (Hser et al., 2001) points to the need to study them concurrently. Adolescence is a critical period of development over the life course (Crockett and Petersen, 1993). The presence of mental health problems and substance use behaviors during this life stage is a strong predictor for sustained psychological, behavioral, and social problems in adulthood (Anderson et al., 2015; Marion et al., 2013; O'Connor et al., 2017; Richards and Huppert, 2011; Thapar et al., 2012). The developmental outcomes of adolescents, shaped by individual- and family-level risk factors (Cairns et al., 2014; Schuch et al., 2018), are further complicated by the varying exposure to contextual-level risk factors. Research concerned with the

respective role of neighborhood and school contexts, and the associated social mechanisms that may channel the effects of structural disadvantage to adolescent health and well-being is robust (Leventhal and Brooks-Gunn, 2000; Sampson et al., 1997; Sampson et al., 2002; Seaton and Yip, 2009). This research highlights neighborhood or school socioeconomic status as potential structural determinants of adolescents' well-being.

A multitude of studies investigating the contextual determinants of adolescents' mental well-being and substance-related behavior treat school and neighborhood contexts separately (Chang et al., 2016; Hargrove et al., 2020; Kuhl and Burrington, 2020). However, this approach could be an issue when adolescents spend a significant portion of their day in both their school and neighborhood communities. These contexts provide adolescents with an important opportunity to develop relationships with peers and other adults, and to engage in activities in and outside of the classroom (Feldman and Matjasko, 2005). Due to an increasing availability of methods suitable to analyze school and neighborhood contexts simultaneously, a handful of studies have

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emerged which investigate the joint impact of socioeconomic disadvantages on adolescents' mental well-being, at the school- and neighborhood-level (Brewer et al., 2017; Dunn et al., 2015; Evans et al., 2016). Nevertheless, this emergent literature has only begun to consider how contextual socioeconomic environments are related to substance-related behavior outcomes in adolescence and young adulthood (Milliren et al., 2017). Additionally, few studies have examined the potential moderating role of social support on the relationships between neighborhood and school socioeconomic disadvantages and the health and behavioral outcomes of youth (Stockdale et al., 2007; Wight et al., 2006).

The purpose of this paper is to estimate the simultaneous effects of neighborhood and school socioeconomic contexts on multiple health indicators among adolescents over and above key individual characteristics and family background. The analysis also investigates the possible moderating role of social support on the associations between adverse contextual exposure and adolescents' health and well-being. We suggest that socioeconomic disadvantages in neighborhoods and schools can influence adolescent mental well-being and substance-related behavior negatively. In addition, much less attention has been devoted to identifying protective factors that reduce health and developmental risks in adolescents. Perhaps one of the most important—and easily implemented—protective factors is the social support derived from families, teachers, and friends. We draw on data from the National Longitudinal Study of Adolescent to Adult Health (Add Health), a nationally representative longitudinal survey of adolescents in the United States, in conjunction with the census and school administrative data describing the socioeconomic status of adolescent respondents' residential neighborhood and school contexts. We use a novel application of cross-classified multilevel modeling (CCMM) to examine if and to what extent school and neighborhood socioeconomic disadvantages simultaneously predict adolescent mental well-being and illicit drug use. We further examine the moderating role of social support on the relationships between contextual disadvantage and adolescent outcomes. Our results have practical importance for guiding the design of community-level interventions intended to improve adolescent developmental health, and for ensuring a healthy transition from adolescence to adulthood.

2. Theoretical framework and hypotheses

2.1. Contextual socioeconomic disadvantage and adolescents' mental and behavioral health

Adolescents and their developing outcomes are simultaneously shaped by overlapping social contexts. While adolescence is a period of significant development characterized by increases in independence and autonomy, their lives are more spatially circumscribed than the lives of adults, and they spend most of their time in their local communities (Allison et al., 1999). Although school composition may reflect neighborhood characteristics when children attend neighborhood schools, school is a unique context that compels students to interact with each other through direct competition and enforced contact in a way that differs from the neighborhood.

Newer research efforts have begun to clarify the importance of neighborhood and school contexts in understanding adolescents' well-being. Germane to our study are the theories concerned with the social determinants of health, which suggest that social and economic contexts may contribute to the differential distribution of health outcomes (Berkman et al., 2014). In other words, the levels of risk exposure at the contextual level contribute to adolescents' developmental outcomes. Research in this area demonstrates that residents of disadvantaged neighborhoods and schools tend to exhibit higher levels of depression and anxiety than residents of more advantaged contexts (Dunn et al., 2015; Goldstein et al., 2019; Ross, 2000; Ross and Mirowsky, 2001; Ross and Mirowsky, 2009). For example, Ross (2000),

using data from the Community, Crime, and Health (CCH) survey, shows that adults who live in disadvantaged neighborhoods (indicated by the percentage of households below the federal poverty line and female-headed households with children) tend to exhibit higher levels of depression and anxiety than residents of less disadvantaged neighborhoods. Similar findings also emerge in studies examining the association between school socioeconomic disadvantage and the mental health of youths (Goodman et al., 2003; Li and Lerner, 2011). Goodman et al. (2003), using data from Add Health, find that average school income is significantly related to depressive symptoms after adjusting for individual-level factors. These findings are consistent with the view that social environment matters for developmental outcomes in adolescents over and above a range of individual attributes. The interrelations among multiple settings—including schools and neighborhoods—that adolescents are socialized in daily may work jointly to shape adolescent development and well-being.

There are several ways through which socioeconomic disadvantage of neighborhood and school contexts translate into adverse mental and behavioral outcomes. First, socioeconomic disadvantages at the school- and neighborhood-level may negatively impact adolescents' mental and behavioral outcome through a resource deprivation mechanism. Adolescents and their families living in the economically disadvantaged neighborhoods tend to have restricted access to resources that are consequential for general developmental outcomes among adolescents, such as safe housing options or quality healthcare (Jencks and Mayer, 1990; Robert, 1999; Sastry and Pebley, 2010). Similarly, a disadvantaged school socioeconomic context can also exert a negative impact on adolescents due to resource constraints. Low-SES schools are more likely to have lower financial expenditures per student and less likely than high-SES schools to possess the organizational resources and practices that foster a positive developmental environment (Arum, 2000; Li and Fischer, 2017). Students from low-SES schools may also experience inadequacies in school-related services such as counseling (O'Connor et al., 2018). As a result, adolescents' developmental outcomes are likely to be compromised when they lack essential resources in their communities and schools.

Second, disadvantaged neighborhood and school contexts can undermine mental and behavioral health by exposing residents to conditions that they define as stressful (Aneshensel and Sucoff, 1996; Ross, 2000). Adolescence is a sensitive life course period when youth tend to develop a heightened sense of socio-cultural awareness and susceptibility (Blakemore and Mills, 2014; Crone and Dahl, 2012). As adolescents become more perceptive of their residential and school contexts, their consciousness of social class is more likely to be affected by it (Chase-Lansdale et al., 2003). Residing in disadvantaged neighborhoods characterized by socioeconomic hardships and visible signs of disorder increases the probability of perceiving and experiencing deprivation or danger in the environment (Raudenbush, 2003; O'Brien et al., 2019; Schieman, 2009). Aneshensel and Sucoff (1996), using data collected from adolescents in Los Angeles County, demonstrate that youths who perceive high levels of "ambient hazards" (e.g., crime, violence, drug use) tend to report higher levels of anxiety and depression than youths who perceive fewer problems in the environment. Although there is a lack of direct evidence concerning school disorder and mental health among youths, studies generally suggest that disorders, such as physical attacks, social manipulation and verbal victimization, are more prevalent in low-SES schools than high-SES schools (Patton et al., 2013). Adolescents attending low-SES schools may face heightened adverse experiences that lead to chronic states of stress, feelings of inferiority, and elevated risks of depression, anxiety and other behavioral problems (Grills and Ollendick, 2002; Rigby, 1998). Under these stressful living and learning conditions, individuals may engage in negative behaviors in order to cope. Thus, structural socioeconomic disadvantages in neighborhood and school contexts entail stressful conditions that can induce negative feelings among adolescents and elevate their risks of depression and substance abuse.

A third possible explanation for the association between disadvantaged contexts and behaviors and mental well-being among adolescents is related to social networks and peer influences. The epidemic theory posits that social problems and problematic behaviors are contagious and are primarily swayed through peer influences (Crane, 1991). Notably, adolescence is a critical period for the formation of behavioral patterns, making them particularly susceptible to peer influence. Developmental studies of conformity (e.g., Berndt, 1979; Santor et al., 2000) suggest that adolescents in disadvantaged contexts have closer ties to peers and rely more on peer networks for informal support. While peer networks make adolescents in disadvantaged contexts feel better about themselves socially, they may also induce greater pressure among adolescents to conform with deviant behaviors, such as substance abuse and illicit drug use (Case and Katz, 1991; Chuang et al., 2005; Pals et al., 2016; Simons et al., 1996). The formative aspect of deviant behaviors could be reinforced further through a socioeconomically homogenous peer network in adolescents' local communities and schools (Blakemore and Mills, 2014). Therefore, it is possible that the well-being and behavior of adolescents are adversely influenced by the peer networks existing within the disadvantaged socioeconomic contexts.

2.2. The moderating role of social support

A growing literature suggests that the amount of perceived social support is positively associated with widespread physical and mental health benefits in adolescence (Cohen and Syme, 1985; Harker, 2001; Vilhjalmsson, 1994). Perceived social support is commonly considered a form of support that adolescents feel is available if needed (Cobb, 1976), and it is a key predictor of adolescent well-being (Laursen and Collins, 2009). Systematic reviews suggest that perceived social support plays an important role in protecting against depression and substance abuse within the general population, as well as in adolescence (Garipey et al., 2016; Santini et al., 2015). When adolescents encounter negative events or stressors related to socioeconomic disadvantages in their environments (e.g. ambient hazards), it takes certain resources to cope (Wight et al., 2006). The perceived social support from family, friends, and teachers can be a particularly important resource for adolescents to buffer against the negative psychosocial and behavioral effects of contextual disadvantage (Cohen, 2004; Reblin and Uchino, 2008; Thoits, 1995).

However, whether perceived social support has the same protective role in more or less disadvantaged contexts is largely unknown. The buffering model suggests that social support is more important in suppressing the deleterious effects of contextual disadvantage when the disadvantage is high (Cohen and Wills, 1985). Our reasoning is based on prior research that attributes interpersonal resources as a buffer that protects individuals from the negative impact of disadvantaged contexts (Kim et al., 2009; Latkin and Curry, 2003; Schieman and Meersman, 2004). Youths in a more disadvantaged context often face a conglomerate of socioeconomic risk factors compared to youth in a less disadvantaged context (Braveman and Gottlieb, 2014). Accordingly, youths of disadvantaged contexts need a substantial amount of social support to counteract the negative health and behavioral impacts of contextual disadvantages. In addition, the perception that others will be available to provide the appropriate assistance in times of need may reduce adolescents' dependence on their local communities and schools, thereby minimizing the negative influence of contexts on their health and behaviors.

Alternatively, the protective role of social support could be stronger for adolescents in the least disadvantaged contexts. This hypothesis is in line with the augmentation hypothesis (Chiang and Park, 2015), which posits that individuals in more advantaged contexts are able to tap into additional resources through the social support that is available to them. This hypothesis is based on the understanding that the protective function of social support does not automatically translate into health and behavioral benefits for adolescents, but largely depends on the

capacity of individuals to activate such benefits. Adolescents in advantaged school and neighborhood contexts often actively engage in various social and developmental activities that could serve to activate and amplify the protective function of social support (Cook et al., 2002). For instance, adolescents who attend a low socioeconomic status school are less likely than adolescents attending a high socioeconomic status school to have more resources in counseling services, parent involvement, and extracurricular activities (Betts et al., 2000; Klugman, 2012). Each of these resources can help students not only develop social relationships, but also help them realize and translate these social relationships and support into a means of resisting the negative impact of the environment (if any) and positively promote mental and behavioral outcomes among adolescents and young adults.

3. Data and methods

This study uses data from the National Longitudinal Study of Adolescent to Adult Health (Add Health), a nationally representative, school-based sample of 20,745 adolescents in grades 7 through 12 surveyed during the 1994–1995 academic year. To create this representative sample, Add Health includes a systematic random sample of high schools and their feeder schools (junior high and middle schools from which many or most students progress to a particular high school) across the United States. A total of 134 schools participated in the baseline study, with a response rate of 78.9%. A complete enumeration of all students was generated from student participation in an in-school questionnaire, combined with a student roster provided by the school (Bearman et al., 1997). In-home surveys were given out to a random sample of adolescents drawn from the school rosters of those completing the initial in-school survey. In-home interviewers recorded the home address of each respondent so that the interview data is linked to the geographic data compiled at the state, county, tract, and block group levels (Billy et al., 2002).

Our study uses 1990 census tracts to define respondents' neighborhoods and extracts variables from census data to measure the neighborhood socioeconomic characteristics associated with the adolescent's residence in 1995 when the initial in-home interviews were collected. Although census tracts are imperfect operationalizations of neighborhoods (Tienda, 1991), they come closer than any commonly available spatial entity to representing the usual conception of a neighborhood (Sampson and Raudenbush, 1999; South and Crowder, 1997).

We restrict the sample for this analysis to those respondents completing in-home surveys at Wave I. Respondents missing information on demographic characteristics, family background, school and neighborhood contextual information are excluded, leaving an analytical sample of 12,950. These respondents were nested in 1667 neighborhoods and 116 schools.

3.1. Youth mental and behavioral health outcomes

Youth self-reported on their mental and behavioral health using well-validate measures. These measures are coded such that higher scores indicate more severe symptomatology or higher engagement. The first outcome measure is adolescent report of *depressive symptoms* from the Center for Epidemiologic Studies-Depression Scale (CES-D). Depressive symptoms were based on 20 Add Health survey items that corresponded with the 20-item CES-D (Radloff, 1977). Prior research has indicated that the CES-D is a valid and reliable measure of depressed mood in adolescents (Al-Modallal and Hanan, 2010; Dozeman et al., 2011; Ros et al., 2011). Total CES-D scores represent summation of the 20 items, producing a range from a possible 0 (no depressive symptoms) to 60 (most frequent/severe depressive symptoms). In our supplemental analysis, we also use discrete measures of depression as symptoms associated with depression may not have an effect on an outcome until some threshold is reached (Kessler, 2002). Following previous studies (Lehrer et al., 2006), the dichotomous measurement of depression uses a

CES-D cutoff score of 23 for girls and 21 for boys to identify adolescents who are at risk for major depressive disorder. Results from dichotomous depression measures are qualitatively similar to what we report in this article. These supplemental results are shown in the Appendix. The second outcome variable is illicit drug use. This is a count variable summing up the number of times that each respondent uses marijuana, cocaine, inhalants, and other illegal drugs in the past month.

3.2. Neighborhood and school socioeconomic status

Neighborhood SES disadvantage consists of a single factor derived from the principal components analysis of three census tract variables: proportion of households receiving public assistance, proportion of individuals living below the poverty level, and proportion of individuals aged 25+ without a high school diploma. All values are standardized with a mean of zero and a standard deviation of one prior to conducting principal component analysis due to differences in units of measurement (Dawson et al., 2019; Ringnér, 2008). This single factor score is then transformed into quartiles, distinguishing the least socioeconomically disadvantaged areas (the lowest quartile) from moderate disadvantaged areas (the middle two quartiles) and most disadvantaged areas (the top quartile).

School socioeconomic disadvantage, which is constructed in a comparable manner as the disadvantage score at the neighborhood-level. We aggregate students' parental education and family income to the school-level to capture the proportion of students whose parental education is less than high school and the proportion of students whose family income is less than \$15,999 (the lowest income bracket in the survey) at each school. Additionally, the information regarding the proportion of students receiving reduced or free lunch programs at each school was made available directly in the survey. We use these three indicators to construct a single school SES disadvantage factor score using principal component analysis. We then transform the single factor score into quartiles, where the lowest quartile of the score distribution represents the least socioeconomically disadvantaged schools, the middle two quartiles represents the moderately disadvantaged schools, and the highest quartile represents the most disadvantaged schools.

3.3. Perceived social support

Social support in adolescence usually involves instrumental, informational, or emotional resources from social networks and intimate relationships (House, 1987; Lin, Dean, and Ensel 1986). Hence, the perceived social support variable intends to capture the overall support that adolescents felt they received from their family, schoolmates, and teachers. We follow previous research (Harker, 2001) and measure social support through an index of eight questions, such as "how much do you feel that your teachers/parents/friends care about you," and "how much do you feel that you and your family have fun together, family pays attention to you." Responses to these questions were ordinal in nature, ranging from 1 (not at all) to 5 (very much). We summed up the responses, and the final score ranges from 8 to 40, and the index's reliability score is 0.80. A lower score of perceived social support indicates low social support, whereas a higher score indicates high levels of social support.

3.4. Other control variables

We control for several other demographic and socioeconomic characteristics previously shown to significantly predict depressive symptoms and illicit drug use, including age, sex, race/ethnicity, and parental socioeconomic status. Age is a continuous measure, and we code sex as 0 if the respondent was female and 1 if male. Race/ethnicity is a categorical variable, distinguishing non-Hispanic whites from Hispanics, African Americans, and Asians or other racial/ethnic groups. Other potential individual-level confounders of interest include parental

educational attainment and whether both parents were present in the home (yes or no). Parental education represents the higher of maternal or paternal education level reported in the Wave I parental questionnaire, categorized as high school or less (reference group), some college, and college or more. Annual family income reported by parents in the parental questionnaire is recoded into a series dummy variable: \$15,999 or less, \$16,000–\$34,999, \$35,000–\$59,999, \$60,000 and more. To retain respondents whose family income was missing, we generate a dummy variable, and it takes a value of 1 if respondent's family income information was missing. Finally, we control for ecological settings of schools, including a categorical variable capturing the region (i.e., Northeast, West, Midwest, and South) and urbanicity (urban, suburban, and rural) of schools.

3.5. Analysis

We carried out our analysis in several steps. First, we estimated three null models: a school-only hierarchical model, a neighborhood-only hierarchical model, and cross-classified multilevel model (CCMM), which accounted for simultaneous nesting of adolescents in their schools and neighborhoods. The fit statistics from the neighborhood- and school-specific null models (not shown here) suggested that CCMM fits the best. Therefore, we fitted a CCMM to account for the fact that individuals simultaneously belonged to two non-nested contexts— school and neighborhood. In the next step, we estimated a CCMM that contained school and neighborhood socioeconomic disadvantage indicators with cross-classified effects, respectively. Next, we included all individual-, school-, and neighborhood-level variables in the final model. Finally, we estimated models with cross-level interaction terms between school and neighborhood socioeconomic disadvantage indicators and perceived social support.

Depressive symptom scores are grand-mean centered. Illicit drug use is over-dispersed with excessive zeros, so we use zero-inflated negative binomial regression analysis to assess the associations between contextual socioeconomic disadvantages and illicit drug use among adolescents. A significant chi-squared goodness of fit test confirmed that the negative binomial model was preferred over Poisson. Statistical significance was determined by two-tailed tests ($p < 0.05$) and incidence rate ratios (IRR) – exponentiated coefficients - are reported. Because the weighting techniques for cross-classified methods have not been established (Raudenbush and Bryk, 2002), we follow previous research in this field and opt to use a non-weighted analysis (e.g., Dunn et al., 2015; Milliren et al., 2017), while controlling for sample characteristics and thus reducing the heterogeneity in the sample (Lee and Forthofer, 2006).

4. Results

4.1. Sample characteristics

Table 1 describes characteristics of our sample. The average depressive symptom score was 13.349. On average, respondents reported using illicit drugs 1.782 times, and among them, 84% did not use any illicit drugs during the past 30 days. Youth in the sample averaged 16 years old. Male and female students were almost equally distributed, and just above 50% of the respondents were Whites (54%), and nearly 70% lived with both biological parents at the time of survey. Roughly 13% of respondents' parents have less than a high school education or equivalent, and about 16% of respondents were from households with a total income of \$15,999 or less, indicating that a small portion of sample students were from socioeconomically disadvantaged family backgrounds. The average social support index score is 31.85, suggesting that the level of social support that adolescents perceived to have is high.

Of our interests are the socioeconomic profiles at the neighborhood- and school-level. The lowest quartile of the neighborhood socioeconomic disadvantage represents the least disadvantaged neighborhoods. The average socioeconomic disadvantage index score is -1.739. The

Table 1
Descriptive Statistics for Variables in the Analysis: Add Health Wave I data.

	Mean or %	SD	Min	Max
Dependent variable				
Depressive symptom score	13.349	(7.099)	0	54
Illicit drug use count	1.782	(7.487)	0	61
Individual-level variables				
Age	16.062	(1.674)	11.42	21.333
Male	51.2%		0	1
Race/ethnicity				
Non-Hispanic white	54.3%		0	1
Hispanics	16.3%		0	1
Non-Hispanic black	21.9%		0	1
Non-Hispanic Asian or other	7%		0	1
Two-parent household	68.4%		0	1
Parents' highest educational attainment				
Less than high school	12.8%		0	1
High school graduate or equivalent	26.6%		0	1
Some college	26.4%		0	1
College or more	34.2%		0	1
Family income				
0-15,999	15.8%		0	1
16,000-34,999	24.3%		0	1
35,000-59,999	28.3%		0	1
60,000-99,999	9.7%		0	1
Missing	22.4%		0	1
Social support index	31.851	(4.713)	8	40
School-level control variables				
School region				
West	25.8%		0	1
Midwest	25.6%		0	1
South	39.0%		0	1
Northeast	9.6%		0	1
School urban scale				
Urban	22.5%		0	1
Suburban	58.4%		0	1
Rural	19.1%		0	1
Neighborhood Socioeconomic Disadvantage Index Score				
Lowest (Lowest quartile)	-1.739	(.340)	-2.730	-1.262
Middle (Middle two quartiles)	-.447	(.564)	-1.258	.885
Highest (Highest quartile)	2.645	(1.291)	.904	7.341
School Socioeconomic Disadvantage Index				
Lowest (Lowest quartile)	-1.550	(.248)	-2.239	-1.292
Middle (Middle two quartiles)	-.194	(.586)	-1.256	.794
Highest (Highest quartile)	2.180	(.982)	.829	4.630
Number of observations (N)	12,950			
Number of neighborhoods	1,667			
Number of schools	116			

middle two quarters of the neighborhood disadvantage index were grouped into the moderate disadvantaged group, with an index score of -.447. The highest quartile of the neighborhoods was grouped into the high disadvantaged group with an index score of 2.645. Parallel to the neighborhood disadvantage measures, the lowest quartile of the school socioeconomic disadvantage distribution had a disadvantage score of -1.550, followed by moderate disadvantaged schools with an average disadvantage score of 0.194. The most disadvantaged schools had a disadvantage score of 2.180. All 12,950 participants were clustered in 116 schools and 1667 neighborhoods.

4.2. Contextual socioeconomic disadvantage and depressive symptoms

Table 2 presents the results of the associations between contextual disadvantages and adolescents' depressive symptoms from the nested cross-classified multilevel model. Model 1 shows the results of a null model (i.e., no covariates). The average standardized depressive symptom score is close to 0 ($b = -0.316$, $p < 0.01$). As shown in the random effect components, the between-level variance in depressive symptoms were driven largely by neighborhoods ($\sigma_{u,k}^2 = 0.933$) as opposed to schools ($\sigma_{u,j}^2 = 0.553$). Model 2 adds to the null model individual-level covariates and neighborhood socioeconomic disadvantage indicators. Of our particular interests are the coefficients of neighborhood

socioeconomic disadvantage indicators. Compared to adolescents of low neighborhood disadvantage, adolescents of moderate and high neighborhood disadvantage have a depressive symptom score that is 0.352 and 1.022 standardized points higher, respectively. Social support is strongly and negatively associated with depressive symptom scores. For one standard deviation increase in social support score, the depressive symptom score is expected to decrease by 0.615 standard deviation ($p < 0.001$). The coefficients of other covariates are generally consistent with our expectation. For example, high parental socioeconomic status is a strong protective factor for adolescents' depressive symptoms. Compared to adolescents of low parental education and low family income, adolescents of higher parental education and higher family income have a graded lower depressive symptom score. Adding these individual-level characteristics and neighborhood SES disadvantage indicators attenuated the between-level variance for schools and neighborhoods, as well as the individual-level residual variance. The decline was more striking in neighborhoods (from 0.933 to 0.110), indicating that the between-level variation in depressive symptoms was due largely to compositional effects (i.e., characteristics of adolescents in the neighborhoods).

Model 3 of Table 2 adds to Model 1 school socioeconomic indicators and individual-level control variables. The positive coefficient for high socioeconomic disadvantage of schools indicates that, compared to adolescents of the least disadvantaged schools, adolescents of highly disadvantaged schools have, on average, higher depressive symptom scores by 0.525 standardized points ($p < 0.05$). The final model—Model 4—includes both neighborhood- and school-level socioeconomic disadvantage indicators, as well as other control variables. The coefficients of moderate and high neighborhood disadvantage remain large in magnitude and statistically significant. This result suggests that adolescents of neighborhoods characterized as moderate and high disadvantage have significantly higher depressive symptom scores than adolescents of least disadvantaged neighborhoods, pointing to neighborhood SES disadvantage as a strong risk factor for adolescent depression. Also worth noting is that the coefficient of high socioeconomic disadvantage at the school-level remains to be significant. It provides suggestive evidence that school socioeconomic disadvantage could exert an impact on depressive symptoms over and above the negative impact of neighborhood socioeconomic disadvantage.

4.3. Contextual socioeconomic disadvantage and illicit drug use

Table 3 presents parallel results from negative binomial cross-classified multilevel models predicting the relationships between contextual socioeconomic disadvantage and illicit drug use among adolescents. Model 1 is the null model with no predictors. As shown in the random effect components of Model 1, the between-level variances in the likelihood of adolescent illicit drug use were driven more by schools ($\sigma_{u,j}^2 = 0.605$) than by neighborhoods ($\sigma_{u,k}^2 = 0.491$). Model 2 adds to Model 1 neighborhood socioeconomic disadvantaged indicators, along with other control variables. Similar to the coefficients in models predicting depressive symptom scores in Table 2, the coefficients of neighborhood socioeconomic disadvantage indicators are large in size and statistically significant, suggesting that there is a gradient between the level of neighborhood disadvantage and the risk of illicit drug use. Specifically, compared to adolescents of least disadvantaged neighborhoods, adolescents of neighborhoods characterized as moderate and high disadvantage, on average, have a 37% ($IRR = 1.373$, $p < 0.01$) and 63% ($IRR = 1.633$, $p < 0.05$) increased risk of illicit drug use, respectively. Importantly, social support is strongly and adversely associated with the risk of illicit drug use. The IRR of social support indicated that for one standardized score increase in social support index, the expected risk of illicit drug use would decrease by 12% ($IRR = 0.879$, $p < 0.001$).

In Model 3, we add school-level socioeconomic disadvantage indicators to the null model, along with other covariates. The coefficient of

Table 2

Nested cross-classified multilevel models predicting adolescents' depressive symptoms: Add Health Wave I, 1994–1995.

	Model 1		Model 2		Model 3		Model 4	
	β	(s.e)	β	(s.e)	β	(s.e)	β	(s.e)
Intercept	-0.316**	(0.108)	2.119***	(0.418)	2.562***	(0.421)	2.259***	(0.430)
<i>Individual-level variables</i>								
Age			0.092*	(0.040)	0.092*	(0.039)	0.087*	(0.040)
Male			-1.956***	(0.114)	-1.959***	(0.114)	-1.953***	(0.114)
Race/ethnicity								
Non-Hispanic white								
Hispanics			0.679**	(0.207)	0.810***	(0.208)	0.714***	(0.208)
Non-Hispanic black			0.408*	(0.180)	0.624***	(0.178)	0.443*	(0.181)
Non-Hispanic Asian or other			1.521***	(0.259)	1.600***	(0.260)	1.546***	(0.260)
Two-parent household			-0.305*	(0.136)	-0.304*	(0.137)	-0.304*	(0.136)
Parents' highest educational attainment								
Less than high school								
High school graduate or equivalent			-0.851***	(0.206)	-0.911***	(0.206)	-0.864***	(0.206)
Some college			-1.620***	(0.210)	-1.692***	(0.210)	-1.633***	(0.210)
College or more			-1.681***	(0.217)	-1.793***	(0.217)	-1.701***	(0.217)
Family income (reference = 0–15,999)								
16,000–34,999			-0.462*	(0.192)	-0.504**	(0.193)	-0.472*	(0.193)
35,000–59,999			-0.842***	(0.203)	-0.925***	(0.203)	-0.856***	(0.203)
60,000–99,999			-0.676**	(0.242)	-0.735**	(0.242)	-0.682**	(0.242)
Missing			-0.850***	(0.225)	-0.966***	(0.225)	-0.874***	(0.226)
Social support index			-0.615***	(0.012)	-0.614***	(0.012)	-0.615***	(0.012)
<i>School-level control variables</i>								
School region (reference = Northeast)								
West			0.535	(0.330)	0.532	(0.327)	0.515	(0.326)
Midwest			-0.144*	(0.321)	-0.039	(0.321)	-0.132	(0.319)
South			0.209	(0.309)	0.378	(0.311)	0.288	(0.310)
School urban scale (reference = rural)								
Urban			-0.352	(0.279)	-0.442	(0.279)	-0.331	(0.278)
Suburban			-0.058	(0.240)	-0.183	(0.245)	-0.095	(0.242)
<i>Neighborhood SES Disadvantage</i>								
Low (reference group)								
Moderate			0.352*	(0.163)			0.398*	(0.168)
High			1.022***	(0.218)			1.147***	(0.235)
<i>School SES Disadvantage</i>								
Low (reference group)								
Moderate					0.046	(0.217)	0.177	(0.225)
High					0.525*	(0.280)	0.579*	(0.292)
Variances of random effects								
Neighborhood ($\sigma_{u,k}^2$)	.933		0.110		0.112		0.101	
School ($\sigma_{u,j}^2$)	.553		0.373		0.410		0.381	
Residual	48.624		38.707		38.759		38.756	
BIC fit statistics	80571		77714		77720		77918	
Number of observations	12,950		12,950		12,950		12,950	
Number of neighborhoods	1,667		1,667		1,667		1,667	
Number of schools	116		116		116		116	

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (two-tailed tests). Standard errors (s.e) in parentheses.

moderate school disadvantage is significant and positive ($b = 0.422$, $p < 0.05$), indicating that the risk of illicit drug use for adolescents attending moderate disadvantage schools is about 35% higher than adolescents attending least disadvantaged schools ($IRR = 0.656$, $p < 0.05$). However, the risk of illicit drug use is indistinguishable between adolescents in the most and least disadvantaged schools ($IRR = 0.948$, $p > 0.05$). Model 4 includes both school-level and neighborhood-level SES disadvantage indicators, as well as other control variables. The coefficients of neighborhood disadvantage indicators remain positive and statistically significant, indicating adolescents of moderate and high neighborhood disadvantage have a graded increase in the risk of illicit drug use compared to adolescents of least disadvantaged neighborhood. The coefficient of moderate school disadvantage remains positive and significant, suggesting that the risk of illicit drug use for adolescents attending schools of moderate disadvantage is higher in comparison to adolescents attending least disadvantaged schools. The coefficients of other control variables remain largely unchanged from Model 2 to Model 4, and they are consistent with prior literature. For example, as age goes up, so does the risk of illicit drug use. Additionally, a higher level of family socioeconomic status (particularly family income) significantly predicts a lower risk of illicit drug use (Goodman and Huang, 2002).

4.4. The moderating role of perceived social support

Table 4 presents the results of moderating effects of social support in the associations between contextual SES disadvantage and depressive symptoms scores (Model 1) and illicit drug use (Model 2). In Model 1, the coefficient of social support was attenuated to -.125 (compared to -.615 in Model 4 of Table 2). The significant and positive interaction terms between neighborhood socioeconomic disadvantage indicators and social support in Model 1 revealed that the effect of social support on the depressive symptom score varied as a function of neighborhood SES disadvantage. Fig. 1 illustrates the cross-level interactions between social support and neighborhood socioeconomic disadvantage in Model 1. As shown in the figure, depressive symptoms decrease as youths' perceived social support increases, regardless of the level of socioeconomic disadvantage at the neighborhood level. Notably, when social support is above the mean ($x > 0$), the impact of social support is significantly greater for adolescents in least disadvantaged neighborhoods than for those in the highly disadvantaged neighborhoods. This implied that individuals who were from the least disadvantaged neighborhoods benefited more strongly from social support than peers from more disadvantaged neighborhoods. Thus, high social support is

Table 3

Nested cross-classified multilevel models predicting adolescents' illicit drug use risks: Add Health Wave I, 1994–1995.

	Model 1			Model 2			Model 3			Model 4		
	β	(s.e)	IRR	β	(s.e)	IRR	β	(s.e)	IRR	β	(s.e)	IRR
Intercept	.580***	(.094)	1.786	0.689*	(0.277)	1.992	1.210	(0.292)	3.355	1.014***	(0.297)	2.756
<i>Individual-level variables</i>												
Age				0.296***	(0.020)	1.433	0.272***	(0.018)	1.312	0.274***	(0.019)	1.315
Male				0.531***	(0.060)	1.701	0.504***	(0.053)	1.656	0.528***	(0.057)	1.695
Race/ethnicity												
Hispanics				0.108	(0.113)	1.114	0.111	(0.108)	1.117	0.091	(0.105)	1.095
Non-Hispanic black				-0.265*	(0.109)	0.767	-0.274**	(0.094)	0.760	-0.293**	(0.101)	0.746
Non-Hispanic Asian				-0.568***	(0.144)	0.566	-0.512***	(0.126)	0.599	-0.562***	(0.134)	0.570
Two-parent household				-0.562***	(0.072)	0.570	-0.526***	(0.063)	0.591	-0.534***	(0.067)	0.586
Parents' highest educational attainment												
Less than high school (reference)												
High school graduate or equivalent				0.153	(0.109)	1.165	0.139	(0.096)	1.149	0.137	(0.102)	1.147
Some college				0.250*	(0.111)	1.284	0.303**	(0.098)	1.353	0.281**	(0.104)	1.324
College or more				-0.039	(0.112)	0.962	0.005	(0.103)	1.005	0.005	(0.109)	1.005
Family income (reference = 0–15,999)												
16,000–34,999				-0.223**	(0.102)	0.800	-0.257**	(0.090)	0.773	-0.216*	(0.096)	0.805
35,000–59,999				-0.429***	(0.103)	0.651	-0.498***	(0.095)	0.607	-0.441***	(0.101)	0.643
60,000–99,999				-0.427***	(0.131)	0.653	-0.604***	(0.115)	0.547	-0.532***	(0.122)	0.587
Missing				-0.087	(0.114)	0.917	-0.118*	(0.116)	0.889	-0.180*	(0.107)	0.835
Social support index				-0.129***	(0.119)	0.879	-0.239***	(0.105)	0.787	-0.202***	(0.112)	0.817
<i>School-level control variables</i>												
School region (reference = Northeast)												
West				0.048	(0.197)	1.049	0.006	(0.157)	1.006	-0.032	(0.173)	0.968
Midwest				-0.870***	(0.182)	0.419	-0.742***	(0.147)	0.476	-0.718***	(0.161)	0.488
South				-0.426	(0.276)	0.653	-0.319	(0.209)	0.727	-0.278	(0.234)	0.757
School urban scale (reference = rural)												
Urban				0.518**	(0.161)	1.678	0.511***	(0.125)	1.667	0.504***	(0.139)	1.654
Suburban				0.320	(0.250)	1.377	0.401	(0.193)	1.493	0.398	(0.215)	1.488
<i>Neighborhood SES Disadvantage</i>												
Low (reference group)												
Moderate				0.317**	(0.110)	1.373				0.397***	(0.160)	1.488
High				0.490*	(0.197)	1.633				0.639**	(0.227)	1.894
<i>School SES Disadvantage</i>												
Low (reference group)												
Moderate							0.422*	(0.207)	0.656	0.632**	(0.219)	0.531
High							0.053	(0.260)	0.948	0.477	(0.308)	0.621
Variances of random effects												
Neighborhood ($\sigma^2_{u,k}$)	0.491			0.582			0.607			0.499		
School ($\sigma^2_{u,j}$)	0.605			0.059			0.096			0.028		
Residuals (σ^2_e)	1.168			0.813			0.815			0.806		
BIC fit statistics	30864			25485			25482			25480		
Number of observations	12,950			12,950			12,950			12,950		
Number of neighborhoods	1,667			1,667			1,667			1,667		
Number of schools	116			116			116			116		

Note: IRR stands for Incidence Rate Ratio. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (two-tailed tests). Standard errors (s.e) in parentheses.

protective in socioeconomically advantaged neighborhoods, but confers less mental health benefits in disadvantaged neighborhoods. However, the interactions between school SES disadvantage and social support are not significant in Model 1, and none of the interaction terms are significant in Model 2.

5. Discussion and conclusion

Adolescence is a critical developmental period characterized by biological, cognitive, behavioral and psychosocial changes (Crockett and Petersen, 1993). Although scholars have debated whether the transition to adulthood constitutes a unique developmental stage (Arnett et al., 2011; Côté, 2014; Silva, 2012), there is an agreement that the developmental outcomes in adolescence are important precursors to health in adulthood (Berg et al., 2017; Chen and Harris, 2019; Zhang et al., 2020). The development outcomes during this sensitive life stage are shaped by multiple ecological contexts, although neighborhood context has received the most scholarly attention thus far (Bishop et al., 2020). Using a nationally representative sample of adolescents, we investigated the associations between contextual socioeconomic disadvantages and mental and behavioral health. We also examined the

potential moderating role of perceived social support in modifying the effects of living in a disadvantaged neighborhood or attending a disadvantaged school on depression and illicit drug use. Our findings provide compelling evidence that adolescents' mental and behavioral health do not manifest in isolation from social context; instead, their health is conditioned simultaneously by multiple social contexts that they are embedded in.

Our findings support a broader literature on the possible contextual impact of adolescents' wellbeing and uniquely contribute to evidence on the effects of simultaneous exposure to school and neighborhood disadvantages. We find that disadvantaged socioeconomic contexts—both schools and neighborhoods—are important risk factors for depressive symptoms and illicit drug use among adolescents (c.f. Boulard et al., 2012; Dawson et al., 2019). Importantly, the main effect of contextual-level socioeconomic disadvantage occurred net of individual characteristics, most notably adolescents' family socioeconomic status. These findings are consistent with the view that social environment matters for developmental outcomes in adolescents over and above individual attributes (Dunn et al., 2015; Goldstein et al., 2019; Ross, 2000; Ross and Mirowsky, 2001; Ross and Mirowsky, 2009). It is possible that highly disadvantaged contexts have limited resources available to

Table 4

Cross-classified multilevel models with cross-level interaction terms between social support and contextual socioeconomic disadvantages, Add Health Wave I, 1994–1995.

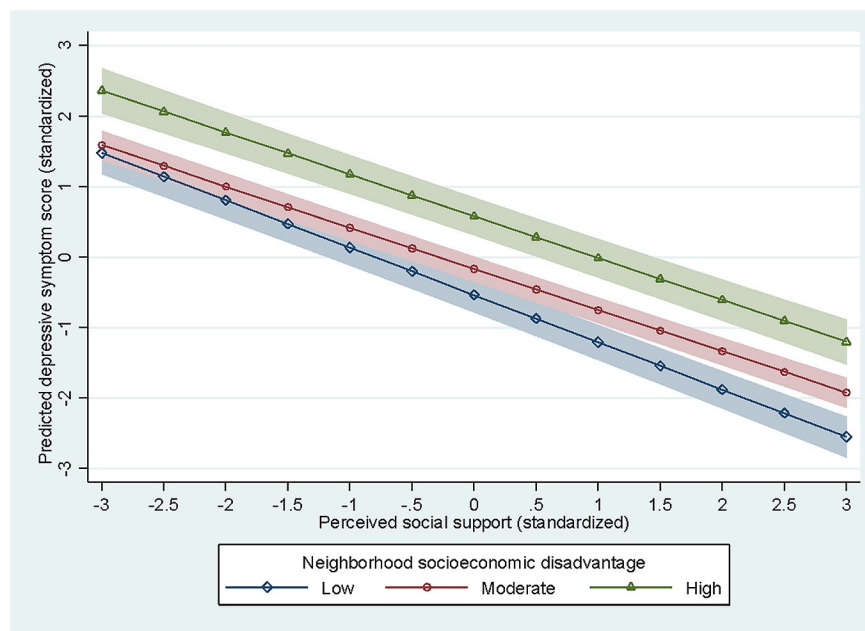
	Depressive symptoms		Drug use		
	Model 1		Model 2		
	β	(se)	β	(s.e)	IRR
Intercept	2.256***	(0.431)	0.999***	(0.294)	2.715
<i>Individual-level variables</i>					
Age	0.086*	(0.040)	0.248***	(0.026)	1.281
Male	-1.957***	(0.114)	0.526***	(0.067)	1.692
Race/ethnicity					
Hispanics	0.710***	(0.208)	0.150	(0.124)	1.162
Non-Hispanic black	0.439*	(0.181)	-0.218	(0.113)	0.804
Non-Hispanic Asian	1.540***	(0.260)	-0.478***	(0.156)	0.620
Two-parent household	-0.298*	(0.136)	-0.296**	(0.112)	0.743
Parents' highest educational attainment					
Less than high school (reference)					
High school graduate or equivalent	-0.865***	(0.206)	0.107	(0.119)	1.113
Some college	-1.632***	(0.210)	0.188	(0.121)	1.207
College or more	-1.704***	(0.217)	-0.095	(0.127)	0.909
Family income (reference = 0–15,999)					
16,000–34,999	-0.477*	(0.193)	-0.296*	(0.112)	0.744
35,000–59,999	-0.856***	(0.203)	-0.541***	(0.118)	0.582
60,000–99,999	-0.688**	(0.242)	-0.560***	(0.142)	0.571
Missing	-0.874***	(0.226)	-0.118	((0.116)	0.889
Social support index	-0.129***	(0.119)	-0.188***	(0.017)	0.829
<i>School-level control variables</i>					
School region (reference = Northeast)					
West	0.511	(0.327)	-0.248	(0.243)	0.780
Midwest	-0.124*	(0.320)	-0.787***	(0.225)	0.455
South	0.277	(0.311)	-0.380	(0.318)	0.684
School urban scale (reference = rural)					
Urban	-0.312	(0.278)	0.370	(0.202)	1.667
Suburban	-0.081	(0.243)	0.106	(0.267)	1.493
<i>Neighborhood SES Disadvantage</i>					
Low (reference group)					
Moderate	0.395*	(0.168)	0.441***	(0.116)	1.554
High	1.142***	(0.235)	0.682***	(0.227)	1.978
<i>School SES Disadvantage</i>					
Low (reference group)					
Moderate	0.178	(0.225)	0.666**	(0.217)	0.514
High	0.529	(0.303)	0.503	(0.305)	0.605
<i>Interaction terms</i>					
Social support* moderate neighborhood disadvantage	0.056*	(0.028)	0.059	(0.039)	1.061
Social support* high neighborhood SES disadvantage	0.045*	(0.023)	0.066	(0.045)	1.068
Social support* moderate school SES disadvantage	0.032	(0.032)	0.030	(0.018)	0.970
Social support* high school SES disadvantage	0.036	(0.044)	0.035	(0.026)	0.966
Variances of random effects					
Neighborhood ($\sigma^2_{u,k}$)	0.100			0.489	
School ($\sigma^2_{u,j}$)	0.381			0.024	
Residuals (σ^2_e)	38.756			0.806	
BIC fit statistics	77919		25849		
Number of observations	12,950		12,950		
Number of neighborhoods	1,667		1,667		
Number of schools	116		116		

Note: IRR stands for Incidence Rate Ratio. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (two-tailed tests). Standard errors (s.e) in parentheses.

support a healthy development in mental and behavioral aspects among adolescents (Jencks and Mayer, 1990; Li and Fischer, 2017; Robert, 1999). The negative impact of social contexts on mental and behavioral health is also likely to stem from a disadvantaged peer network and repeated exposure to environmental stressors such as violence, drug use, and other ambient hazards (Aneshensel and Sucoff, 1996; Raudenbush, 2003; Ross, 2000).

Our findings suggest that social support might be effective at offsetting mental consequences to all. We find social support does not modify the relationship between contextual disadvantage and adolescents' illicit drug use, and it only modifies the relationship between neighborhood socioeconomic disadvantage and adolescents' depressive symptoms. In support of the augmentation hypothesis, our analyses show that social support is more beneficial for youths of less disadvantaged neighborhoods than youths in more disadvantaged

neighborhoods. We are not the first to find these results. For example, Wight et al. (2006), in their analysis of the relationship between socioeconomic characteristics of a large geographic unit (the sampling area) and adolescents' external and internal mental health, also find that high social support is most protective in areas of low socioeconomic disadvantage. It is possible that, for example, neighborhood socioeconomic status is an important variable that facilitates youths' abilities to benefit from social support and to translate social support into desirable mental health outcomes. In contrast, disadvantaged neighborhoods may lack the resources and infrastructure needed to translate perceived social support into mental benefits (Wang and Eccles, 2012). In this sense, neighborhoods of low socioeconomic disadvantages may offer a positive social environment that strengthens the protective role of social support against mental health issues. Nevertheless, the fact that benefits of social support are attenuated in disadvantaged neighborhoods deserves more



Note: Confidence intervals are shaded areas in transparent colors around the lines of the estimates.

Fig. 1. Predicted standardized depressive symptom scores by neighborhood socioeconomic disadvantage, Add Health Wave I.
Note: Confidence intervals are shaded areas in transparent colors around the lines of the estimates.

attention because youths in these disadvantaged contexts are indeed the ones most in need of intervention that may buffer the challenges in concentrated disadvantages.

Future research may benefit from addressing some of the limitations in our analyses. First, the present study defined school socioeconomic status via aggregation of parental education, family income of students, as well as the proportion of students who received free or reduced-cost lunch programs. Using this broad school SES construct that captures human and social factors, we may overlook the direct impact of other school socioeconomic indicators such as school poverty, family structure or students' residential mobility. Future research may consider using alternative measures of school SES and analyze their separate and joint impact on students' wellbeing (Ensminger et al., 2000; Entwisle and Astone, 1994; Goodman et al., 2003). Second, we used students' depressive symptom score as a measure of mental health and illicit drug use as a measure of behavioral health. However, it is possible that other measures of mental health would reveal different relationships between contextual disadvantage and mental health. For example, anxiety may be more sensitive to the day-to-day stressors in students' immediate school environment than depression. In addition, other behavioral problems, such as drinking and smoking, are likely to be susceptible to the disadvantaged social contexts (Cambron et al., 2018; Fagan et al., 2013). Therefore, future research may benefit from extending this analysis to examine other health and behavioral outcomes. Third, our measure of perceived social support does not distinguish different types of support (e.g., appraisal, emotional, informational, and instrumental; Malecki and Demaray, 2003). Some types of social support may be more impactful than others in the events of depression or substance abuse. While we are unaware of empirical studies examining these proposed different types of social support, one can speculate that instrumental support (including spending resources like time, materials, or money)

might be particularly protective for adolescents under financial pressure than for their peers with less financial pressure, whereas emotional support might be more impactful on mental health outcomes than physical or behavioral outcomes. Without studies examining these possible explanations in more detail, these considerations must remain speculative. Finally, the current study's correlational findings represent only a first step in demonstrating the importance of overlapping social contexts. The results, although intriguing, do not shed light on the mechanisms through which disadvantaged contexts impact adolescents' mental and behavioral outcomes. Further studies are needed to unpack the ways in which disadvantaged contexts influence adolescents' well-being. This type of research is particularly important because it provides insights about the place-based interventions that would promote the health and wellbeing of all adolescents.

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Appendix B. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.healthplace.2020.102425>.

Appendix

Table 1A

Cross-Classified Multilevel Logistic Regression Models Predicting the Associations Between Contextual Socioeconomic Disadvantages and Adolescent Depression Risks, National Longitudinal Study of Adolescent Health Wave I, 1994–1995

	Depression (yes v.s. no)		
	Model 1		
	b	(s.e)	OR
Intercept	-1.652***	(0.167)	0.192
<i>Individual-level variables</i>			
Age	0.050*	(0.020)	1.050
Male	-0.351***	(0.061)	0.704
Race/ethnicity			
Hispanics	-0.132*	(0.097)	1.142
Non-Hispanic black	0.09	(0.090)	1.099
Non-Hispanic Asian	0.362***	(0.120)	1.438
Two-parent household	-0.063	(0.069)	0.915
Parents' highest educational attainment			
Less than high school (reference)	—	—	—
High school graduate or equivalent	-0.322***	(0.095)	0.724
Some college	-0.534***	(0.100)	0.586
College or more	-0.442***	(0.104)	0.643
Family income (reference = 0–15,999)			
16,000–34,999	-0.089	(0.093)	0.915
35,000–59,999	-0.258*	(0.102)	0.773
60,000–99,999	-0.077	(0.118)	0.926
Missing	-0.256*	(0.116)	0.774
Social support index	-0.987***	(0.075)	0.373
<i>School-level control variables</i>			
School region (reference = Northeast)			
West	-0.313*	(0.107)	0.731
Midwest	-0.102	(0.098)	0.903
South	-0.177	(0.133)	0.838
School urban scale (reference = rural)			
Urban	-0.047	(0.090)	0.954
Suburban	-0.011	(0.116)	0.989
<i>Neighborhood SES Disadvantage</i>			
Low (reference group)	—	—	—
Moderate	0.239*	(0.110)	1.270
High	0.538**	(0.179)	1.712
<i>School SES Disadvantage</i>			
Low (reference group)	—	—	—
Moderate	0.060	(0.113)	1.062
High	0.245*	(0.123)	1.252
<i>Interaction terms</i>			
Social support* moderate neighborhood disadvantage	0.127	(0.071)	1.124
Social support* high neighborhood SES disadvantage	0.188*	(0.089)	1.092
Social support* moderate school SES disadvantage	0.084	(0.079)	1.097
Social support* high school SES disadvantage	0.125	(0.106)	1.133
Variances of random effects			
Neighborhood ($\sigma_{u,k}^2$)	0.042		
School ($\sigma_{u,j}^2$)	0.073		
Residuals (σ_e^2)	0.802		
BIC fit statistics	7908.3		
Number of observations	12,950		
Number of neighborhoods	1,667		
Number of schools	116		

Note: OR stands for Odds Ratio. *p < 0.05, **p < 0.01, ***p < 0.001 (two-tailed tests). Standard errors (s.e) in parentheses.

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