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A Multilevel Analysis of Gender Differences in Psychological Distress Over Time

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Abstract

Females have higher rates of depression than males, a disparity that emerges in adolescence and persists into adulthood. This study uses hierarchical linear modeling to assess the effects of school context on gender differences in depressive symptoms among adolescents based on two waves of data from the National Longitudinal Study of Adolescent Health ($N = 9,709$ teens, 127 schools). Analysis indicates significant school-level variation in both overall symptom levels and the average gender gap in depression net of prior symptoms and individual-level covariates. Aggregate levels of depressive symptomatology were positively associated with contextual-level socioeconomic status (SES) disadvantage. A cross-level contingency emerged for the relationship between gender and depressive symptoms with school SES and aggregate perceived community safety such that the gender “gap” was most apparent in contexts characterized by low SES disadvantage and high levels of perceived safety. These results highlight the importance of context to understanding the development of mental health disparities.

Although depression and related symptomatology may originate before adolescence, symptoms increase substantially during the teenage years (Costello, Mustillo, Erkanli, Keeler, & Angold, 2003), suggesting that adolescence is critical to understanding the factors that place individuals at risk for future mental illness. Negative psychological experiences that occur at young ages have developmental consequences for future functioning and health (Compas, Hinden, & Gerhardt, 1995; Kandel & Davies, 1986; Lewinsohn, Rohde, Klein, & Seeley, 1999). Furthermore, research from community samples of adolescents consistently demonstrates that females have higher rates of depression than males (Birmaher et al., 1996; Nolen-Hoeksema, 2001; Reinherz, Giaconia, Lefkowitz, Pakiz, & Frost, 1993), a disparity that surfaces during the adolescent years and persists through adulthood (Kessler, Avenevoli, & Merikangas, 2001; Kessler & Walters, 1998). Many of the explanations of this difference implicate experiences from adolescence, alternately suggesting that the gender difference in depression is due to a combination of biological and social factors (Cyranowski, Frank, Young, & Shear, 2000; Nolen-Hoeksema & Girgus, 1994; Wichstrøm, 1999). Given that early experiences of emotional distress are indicative of a lifelong struggle with depression, the disproportionate levels of depressive symptoms among adolescent girls suggest that females are at disadvantage early in the lifecourse for future problems with functioning, health, and psychological well-being. For instance, depressed adolescents typically experience impaired school performance, which can disrupt future educational attainment and financial and occupational success, and have increased rates of other health problems such as substance abuse and unwanted pregnancy (Birmaher et al., 1996). Depression also increases conflict and stress within families and among significant others, thus disrupting relationships and impairing future social functioning (Hammen, Rudolph,

Weisz, Rao, & Burge, 1999). It is of particular concern, then, to understand what the experiences of the adolescent period can tell us about this persistent health disparity.

Prior work investigating the role of social factors in the developing gender disparity in depression has largely been concentrated at the individual level. However, psychological distress is influenced not only by individual level social processes, but also through the institutions and communities in which adolescents develop. Aggregate levels of depressive symptomatology among teens vary across communities (Wickrama & Bryant, 2003), and psychological distress is impacted by macro-level factors such as neighborhood poverty and disorder (Aneshensel & Sucoff, 1996). However, more work is needed that investigates the contextual influences affecting the development of adolescent mental health problems, particularly as this period of the lifecourse is characterized by transitions that involve increased activity beyond the family context through interaction with peer networks and school communities. Although the literature on contextual effects generally suggests that the social context also affects group differences in health outcomes (Leventhal & Brooks-Gunn, 2000), the influence of contextual-level factors in the development of mental health disparities during adolescence also has largely been unexamined. The objectives of this paper are twofold: to examine the overall effect of school context on adolescent psychological distress over time and to investigate the role of school context on emergent gender differences psychological distress.

Social Context and Mental Health

Ecological theories of childhood development provide the necessary structure for the complex interplay between intrapersonal, interpersonal, and environmental factors that affect the development of adolescent psychopathology (Bronfenbrenner, 1979). In general, researchers assert that child and adolescent psychopathology results from difficulties encountered in negotiating developmental tasks (Cicchetti & Toth, 1995) and that these difficulties are best understood in the context of the individual's physical and social milieu (Glantz & Leshner, 2000). Theoretical models describing the mechanisms through which macro-level characteristics affect individual health outcomes emphasize *institutional influences* in the form of the quality and quantity of resources (e.g., schools, health care, and recreational facilities), *relationship influences* in which family characteristics and the quality of the home environment either exacerbate or buffer contextual effects, and *normative influences* in which formal and informal community attributes such as collective efficacy and social control affect the extent to which disorder develops in the community (Jencks & Mayer, 1990; Leventhal & Brooks-Gunn, 2000).

For instance, communities are frequently stratified by many of the same characteristics that affect mental health at the individual level, such as socioeconomic status (SES), and the empirical literature has consistently shown that neighborhood-level poverty negatively impacts health and behavior (Sampson, Morenoff, & Gannon-Rowley, 2002; Sampson, Raudenbush, & Earls, 1997). Multilevel analyses demonstrate that levels of adult emotional distress are higher in socioeconomically disadvantaged neighborhoods (Ross, 2000; Silver, Mulvey, & Swanson, 2002; Wheaton & Clarke, 2003). Adolescent studies of neighborhood effects similarly illustrate the detrimental influence of low SES, ethnic segregation, and low neighborhood cohesion on mental health (Aneshensel & Sucoff, 1996; Sampson et al., 2002; Wickrama & Bryant, 2003). Much of this work is descriptive and assesses the psychological impact of compositional aspects of communities such as poverty level (Goodman, Huang, Wade, & Kahn, 2003) and ethnic composition (Wight, Aneshensel, Botticello, & Sepulveda, 2005) on distress, although there is some indication that these effects are mediated by family processes (Wickrama & Bryant, 2003).

Compared with neighborhoods, considerably less research has focused on the effect of schools on adolescent mental health using a multilevel analytic framework. Although schools are posited as institutional conduits between context influences and individual health (Leventhal & Brooks-Gunn, 2000), schools are also social systems in their own right (Coleman, 1961), and arguably a more proximal and therefore salient contextual influence on health during adolescent development than neighborhoods (Loukas & Robinson, 2004). The vast educational literature on school effects demonstrates that compositional and psychosocial aspects of schools affect academic functioning (Lee & Bryk, 1989; Lee, Smith, & Croninger, 1997). These findings can be extrapolated to inquiries of adolescent psychological well-being, given that many of the individual (e.g., self-esteem, control) and environmental (e.g., supportive, organized) factors that influence academic success are also beneficial to mental health (Johnson, Crosnoe, & Elder, 2001; Ross & Broh, 2000). Furthermore, much of this literature recognizes that the relationship between schools and achievement varies according to an array of background characteristics including race/ethnicity, SES, and gender (Lee, 2000).

There are methodological considerations for studying the effects of schools on mental health as well. Much of the literature on neighborhood effects is based on urban samples and concepts of community culled from Census data. It is unclear if this characterization of context adequately translates for individuals residing in suburban and rural areas. Schools, on the other hand are a more concretely and universally defined entity. Many of the findings pertaining to neighborhood effects are relevant to investigating school contexts, as these institutions generally reflect the stratifying characteristics of their communities. Given the connection between poverty and health, schools in impoverished communities are likely to have higher levels of mental health problems among their student bodies in comparison to those in more advantaged environments.

Schools are also institutions of socialization that contribute to identity development as well as gender norms (Lee, Marks, & Byrd, 1994); thus the culture of the school community is likely to impact psychological development as individuals navigate the challenges of adolescence. The psychosocial impact of schools references the notion of *collective efficacy*—the idea that a sense of cohesion among community members affects the general willingness to act on behalf of the common good (Sampson et al., 1997). Investigation of collective efficacy has been the subject of a growing body of work that notes the importance of the presence of social support at the school level—which is alternately referred to in the education literature as connection, belonging, and attachment (Anderman, 2002; Bearman & Burns, 1998; Jacobson & Rowe, 1999; Johnson et al., 2001; McNeely, Nonnemaker, & Blum, 2002). There is evidence to suggest that school connectedness is inversely associated with adolescent depressive symptoms (Resnick et al., 1997), which has implications for the current study, as levels of school attachment also vary by gender (Johnson, Crosnoe, & Thaden, 2006). Studies suggest that positive school experiences (i.e., a supportive environment, high achievement expectations, low levels of conflict) not only positively affect teens' psychological well-being (Torsheim & Wold, 2001; Way & Robinson, 2003) but also may mediate the negative impact of other influences (e.g., conflict with family, stressful life events) on mental health (Barber & Olsen, 1997; Cheung, 1997) as well as moderate the relationship between coping and psychological distress among vulnerable adolescents (Loukas & Robinson, 2004).

Social Context and Gender

A frequent explanation for gender differences in depression is that disparities stem from systematic differences in reaction to the environment (Birmaher et al., 1996). Social and environmental explanations pertaining to disparities in mental health often implicate group

differences in the exposure, vulnerability, and reaction to *stress* (Cutrona, Wallace, & Wesner, 2006; Pearlin, 1989). This theoretical framework focuses on how individuals are organized in society, suggesting that groups that are disadvantaged both economically and socially (e.g., females, minorities, the poor, and the aged) suffer a disproportionate exposure to stress combined with a lack of resources to counteract the effects of negative experiences that produce higher levels of psychological distress (Aneshensel, Rutter, & Lachenbruch, 1991; Pearlin, 1989). Individuals function within communities and institutions that are stratified by socioeconomic resources and characterized by varying levels of community cohesion; thus, it is reasonable to presume that contextual-level resources may similarly be used to understand inequalities in health outcomes (Diez-Roux, 1998). Also, stress arises from and is mitigated by persons' social relationships; these relationships not only play a role in stress generation and subsequent psychopathology but also act as resources that buffer the stressful influences of other contexts (Pearlin, 1989).

It is well documented that low SES increases reports of depressed mood among adolescents (Costello, Compton, Keeler, & Angold, 2003; Eamon, 2002; Reinherz et al., 1993); however findings pertaining to a gender difference in this relationship vary. Several studies demonstrate that the association between low family SES and elevated depression is moderated by gender, with some claiming that the relationship between low SES and high psychological distress is more evident among girls (Elder, Conger, Foster, & Ardel, 1992; Gore, Aseltine, & Colton, 1992) while others report that it is boys' mental health that is comparatively more sensitive to the effects of poverty (McLeod & Owens, 2004). Other works investigating these relationships report no gender difference in the effects of SES (Schraedley, Gotlib, & Hayward, 1999; Wadsworth & Compas, 2002). In adults, the gender gap in depressive symptoms is often attributed to the status inequality between the sexes due to differences in SES, among other factors (Mirowsky, 1996). For youth, SES is a conferred status, so it is reasonable to assume that the differences posed by the availability or lack of community economic resources may affect male and female teens differently. For instance, the constraints posed by economic deprivation on future options may be more problematic for adolescent females for whom the conflicts between long-term achievement and social success in school are beginning to emerge, given that evidence suggests that early experiences of discrimination related to gender identity are associated with diminished psychological adjustment among girls (DuBois, Burk-Braxton, Swenson, Tevendale, & Hardesty, 2002). Furthermore, the educational literature suggests that while family background and neighborhood (i.e., money and status) are important to the social functioning of adolescents in general, boys indicate more latitude in social mobility and success based on their achievements whereas girls are more apt to be defined by their family resources and thus report less agency in their success (at least socially) in the school environment (Coleman, 1961).

Variation by gender in perceptions of support (i.e., feeling that one is valued and cared for) provides an additional social explanation of the gender difference in psychological distress. Perceptions of support are inversely associated with adolescent depressive symptoms (Wight, Botticello, & Aneshensel, 2006) and are posited to affect depression through intrapersonal feelings of self esteem and mastery (Aneshensel, 1992; Way & Robinson, 2003). It is generally posited that boys and girls receive varying levels of social support to sustain their accomplishment of developmental tasks (Colarossi & Eccles, 2003) and that females are more sensitive to the level of supportiveness derived from social relationships, rendering the buffering effect of social support on psychological distress more salient to girls (Avison & McAlpine, 1992; Schraedley et al., 1999). However, other studies suggest that perceived social support exerts a general influence on adolescent psychological distress and therefore does not explain differences in depressive symptoms between boys and girls (Gore et al., 1992). The expectation that the aggregate level of connectedness perceived by

the student body may affect males and females differently flows from the idea that girls and boys develop differently and the psychosocial aspects of the school environment are not always in sync with adolescents' developmental needs (Loukas & Robinson, 2004). There is some suggestion that variations in school experiences may contribute to group differences in depression, with perceptions of school connectedness being more salient for boys than for girls (Jacobson & Rowe, 1999).

Theoretically, there is also basis for examining gender differences in the association between school context and mental health based on gender differences in socialization experiences. For instance, dissimilarity in the socialization of males and females is likely to result in a different level of contact with the larger environment as well as different reactions to the stresses imposed by SES disadvantage or the buffering impact of community social support. Socialization theory suggests that boys are socialized to be more independent whereas girls are taught to value social relationships (Rosenfield, Vertefuille, & McAlpine, 2000). Theoretically, the greater independence of boys could result in increased interaction with the environment; the socioeconomic constraints of disadvantaged environments like neighborhoods could result in increased stress levels for boys, in turn increasing their risk for psychological distress. Comparatively, curtailing the autonomy of girls could likely increase the importance of more proximal social institutions such as families and schools. Furthermore, the emphasis of social functioning for females could result in the increased salience of community support and cohesion in comparison to boys. Overall, group differences in the impact of the school context on the relationship between gender and psychological distress have not been systematically examined, particularly using multilevel analytic methods, and the current study endeavors to address this gap in the literature.

The Current Study

This study adds to the growing literature investigating the effects of social context on adolescent mental health by examining the role of school-level factors in the emergent gender disparity in depressive symptoms from a nationally representative sample of youth within a multilevel analytic framework. Based on the mechanisms proposed by the research on neighborhood effects and the stress process, this paper investigates the influence of both structural and social school-level resources on the overall macro-level variation in psychological distress as well as gender differences in the responsiveness to environmental stress and support. A notable gap in the application of social stress theories to understanding why females are disproportionately affected by psychological distress is that the empirical inquiries often focus at the level of the individual. This study attempts to address this omission by assessing characteristics of school communities in conjunction with individual-level characteristics on the association of gender and depressive symptoms. The inclusion of individual-level variables also provides an additional layer of methodological rigor to the present analysis, as the omission of individual and family characteristics, which have demonstrated effects on psychological distress, would potentially inflate any estimated contextual effects (Jencks & Mayer, 1990; Leventhal & Brooks-Gunn, 2000). An additional strength of this study is that it takes into consideration the fact that adolescence is a dynamic period by using information from two waves of data and specifically controlling for baseline levels of distress.

Thus, the goals of this study are (1) to assess if school-level variation exists in both the overall level of depressive symptomatology as well as the "gap" between male and female symptom levels; (2) to assess if this variation is associated with school-level characteristics; and (3) to assess if school effects on the gender gap in symptomatology persist after controlling for prior levels of depressive symptoms, family SES, perceived family support as well as adolescent sociodemographic characteristics. It is posited that average symptom

levels will be higher in schools characterized by high SES disadvantage and low levels of connectedness among the students. Based on the stress process, it is anticipated that the association between the school-level factors and distress will be more evident for girls, with conditions of high disadvantage and low connectedness exacerbating the difference in depressive symptomatology between males and females.

METHOD

Sample

Data used for this analysis are from the National Longitudinal Study of Adolescent Health (Add Health). The analysis draws on information obtained from several sources, as described below. The primary source of individual-level information is adolescent self-reports to the in-home interview. Additional data are derived from an in-school questionnaire, a parental interview, and a contextual database that uses 1990 Census data.

The sampling frame for Add Health was comprised of all U.S. high schools, stratified by region, urban/city, school type, ethnic composition, and enrollment size. The primary sampling unit was high schools (i.e., schools including the 11th grade and enrolling at least 30 students); adolescents from 80 high schools and 52 feeder schools (i.e., schools that contained 7th grade and sent students to the selected high school) participated in the baseline survey. A sample of adolescents for the in-depth *in-home interviews* was selected from the school rosters (78.9% response rate).¹ Data were collected using computer-assisted personal interviews (CASI) conducted in either English or Spanish. The first wave of in-home data collection occurred during the 1994–1995 school year and yielded an overall sample of 20,745 adolescents. The second wave of in-home data collection occurred during 1996 and involved all adolescents interviewed at Time 1, with the exception of those who graduated or were part of a targeted subsample at Time 1 (i.e., genetic siblings and disabled teens). The second wave yielded an overall sample of 14,736 adolescents (for additional information on Add Health see Bearman, Jones, & Udry, 1997).

This analysis is restricted to those adolescents who participated in Waves 1 and 2 of data collection and reported complete information for the focal constructs described below. Those teens who indicated moving between waves were dropped from the analysis. Only participants with a sample weight as well as usable individual and group identifiers were used to permit generalizability and hierarchical linkages (i.e., individuals in schools), respectively. Linking the individual-level and school-level data necessitated limiting the analysis to those schools whose students were selected for the in-home data collection. Cases from one institution were dropped due to lack of variation by gender. In some instances, siblings were obtained in the data collection and so one child per family was sampled to eliminate this source of bias from teens nested within families. As a result, data were retained for 9,709 adolescents with complete data from both Time 1 and 2 nested in 127 schools.

Measures

Individual-level risk factors—*Depressive symptomatology* is the focal dependent variable and was assessed during the in-home survey at Times 1 and 2 using a 19-item “feelings scale,” which is comprised of 16 items from the original 20-item CES-D scale.²

¹The in-home sample included a core probability sample ($n = 12,105$) of a nationally representative sample of teens in grades 7 through 12 and three supplemental over-samples: ethnic minorities—African Americans from well-educated families, Chinese, Cubans, and Puerto Ricans; saturated schools (i.e., 100% of the student body was sampled); and disabled teens. The in-home interview was also administered to a supplemental “genetic” sample of siblings, which was not used for this analysis because these cases were not part of the original probability sample.

The CES-D has demonstrated reliability in gauging emotional distress in both adults (Radloff, 1977) and adolescents (Roberts, 1995; Wight, Sepulveda, & Aneshensel, 2004). Add Health respondents reported the frequency of experiencing each depressive symptom within the previous week with response categories ranging from 0 = *never or rarely* to (3) *most of the time*. Positive symptoms were reverse scored. Mean substitution was used to impute data for missing values if the respondent had completed at least 75% of the 16 original CES-D items. Final scores were obtained by summing the items. The 16-item scale demonstrated very good internal consistency and reliability ($\alpha = .85$, both timepoints).

Information regarding adolescents' *sociodemographic characteristics* was collected during the baseline *in-home* interview conducted at Time 1 (see Table 1). Data from the *parent survey* regarding annual household income was used to convey the SES of the adolescents. A logged version of this variable was used in all analyses to compensate for the skewed distribution. Parental education represents the number of years of schooling completed by the parent or, in the case of two-parent families, the average years of parental education. *Family structure* is represented as either 1 = lives with two biological parents or 0 = other family living arrangement. A measure of *academic achievement* was calculated based on adolescent reports of their recent grades received in English, math, science and social studies. These responses ranged from 1 (D or below) to 4 (A) and were summed and averaged across the four grades, creating a proxy of a four-point grade point average similar to other measures of achievement developed for use with Add Health (Crosnoe & Muller, 2004).

Measures of the psychosocial resources of the adolescents at the individual-level include two dimensions of social support reported in the *in-home interview*: perceived parental support and connectedness to the school. A four-item *parental support* scale for both waves was developed using items characterizing the adolescents' relationships with their parents or guardian (e.g., "... how close do you feel with your mother/father/parental figure?"). A support score for adolescents from two-parent families represents the average of responses regarding both mothers and fathers, whereas scores for adolescents from single-parent families represents support from the custodial parent. All item responses were coded on a Likert-type scale (1 = *strongly disagree* to 5 = *strongly agree*); final scores were computed by dividing summated scores by the total number of items. Results from a reliability analysis demonstrated very good inter-item consistency at both timepoints ($\alpha = .87$). A measure of *perceived school connectedness* was developed based on responses to three items (e.g., "... you feel close to people at school") using the same Likert-type response metric described above. The three items were reverse scored so that a higher score represented high perceptions of school connectedness. Each scale demonstrated very good inter-item consistency and reliability at both timepoints ($\alpha = .77$ and $.78$, respectively). Change scores were computed for each dimension of support by subtracting Time 1 from 2 scores to assess the effect of change over time.

Contextual-level risk factors—Information from the adolescent *in-school* survey was used to create aggregate measures of the psychosocial climate among the students within a given school. The in-school survey was administered to all students present at the school, unlike the in-home survey, which was administered to a sample of each school's students. Thus, measures such as *perceived school connectedness* characterize appraisals of cohesion of the entire student body. This scale was developed based on the same items and response scale described above. Final scores were summated and divided by the number of items and then collapsed to the school level in order to represent an average school connectedness

²The three additional items on the "feeling" section of the Add Health survey are not CES-D items and therefore are not included in the measure used for this analysis.

score. Results from a reliability analysis demonstrated very good inter-item consistency ($\alpha = .78$). Perceptions of ambient hazards in the social context have been demonstrated to influence adolescent mental health (Aneshensel & Sucoff, 1996). Therefore, the psychosocial climate of the school was also tested with measures of aggregate *perceptions of school* and *community safety* based on responses to a single statement (e.g., “I feel safe in my school” and “I feel safe in my neighborhood,” respectively). Responses ranged from 1 = *strongly agree* to 5 = *strongly disagree* and were collapsed to the school level for each item in order to assess the average extent of ambient hazards perceived by the student body in both their school and school community.

Characteristics of the school community based on Census tract information were used to create proxy measures of the compositional aspects of the school germane to the current inquiry. One of the advantages of this operationalization is that it avoids any issues of collinearity with the individual-level measures, particularly the adolescent SES variables, which were based on parental reports of income and education. This approach also more adequately describes the SES of the school context—which is characterized not only by the resources of the students and their families, but also by the resources of the community that it serves. *School socioeconomic disadvantage* is represented by a factor score based on four indicators of economic deprivation derived from 1990 U.S. Census tract data using a principal components analysis. These indicators include proportion of households receiving public assistance, proportion of individuals living below the poverty level, proportion of individuals aged 25+ without a high school diploma, and the unemployment rate. For this measure, Census tract data were collapsed to the level of the school, giving an aggregate representation of the level of socioeconomic disadvantage characterizing the communities served by the schools. Given the relationship between SES and racial composition, three indicators of the ethnic composition of the Census tract were also collapsed to the school level and used in the analysis: *average proportion of Non-Hispanic White (NHW)*, *African American*, and *Latino* residents.

Analytic strategy—Descriptive statistics are calculated using the SVY commands in STATA (v.9) (StataCorp, 2003) that adjust variance estimates for the probability sample design and nested data structure as recommended for use with Add Health (Chantala & Tabor, 1999). All multivariate analysis uses hierarchical linear modeling and employs HLM (v.6.01) (Raudenbush, Bryk, & Congdon, 2005). The nested data structure of Add Health necessitates multilevel modeling, as the observations of individuals within groups are dependent, thus violating one of the traditional assumptions of statistical analysis (Raudenbush & Bryk, 2002). All analyses apply grand sample weights and use full maximum likelihood; the advantage of this approach is that the estimates produced are consistent with the true parameters (Raudenbush & Bryk, 2002).³ Continuous school-level predictors are grand-mean centered for purposes of interpretability.

Multilevel modeling simultaneously regresses within-group differences as a function of the differences between groups. The overarching goals of this study are to assess if overall levels of depressive symptoms as well as the gender gap in symptomatology vary across schools and are represented by the following equation:

$$\text{Depress}(T2)_{ij} = \gamma_{00} + \gamma_{10}\text{Gender}_{ij} + (u_{0j} + u_{1j}\text{Gender}_{ij} + r_{ij}). \quad (1)$$

³Initial models were estimated using a normal distribution and a Poisson's distribution to assess the impact of the skewed distribution of the CES-D scale. No differences were found between the two estimation techniques, so the more interpretable results from the normal distribution are reported.

The notation j is used to index schools and i is used to index adolescents within schools. The γ s in this model represent the fixed effects portion of this model, whereas the error terms are the random effects. The intercept γ_{00} is the “grand mean” of depressive symptoms across a population of schools. The term u_{0j} represents the unique effect of school j or a random error term whereas term r_{ij} represents the deviation of the individual’s symptom scores from the predicted school average. The coefficient γ_{10} is the slope for gender, and translates into the average difference between males and females in depressive symptoms in school j , respectively. The slope for gender is random; u_{1j} represents the deviation of the gender difference for school j .

RESULTS

Table 1 lists the weighted individual-level characteristics of the two-wave analytic sample. Overall, the mean CES-D scores obtained at baseline and follow-up were modest (9.08 and 8.99, respectively), suggesting that, on average, these adolescents experienced three symptoms of distress with some regularity in the past week. Bivariate analysis of the association between depressive symptoms and gender indicates that females report higher levels of symptoms at each wave, corroborating the robust association between psychological distress and gender reported in the literature. This sample was approximately equally distributed by gender (50.9% female vs. 49.1% male). Although the sample ages across waves, teens in the young and mid-adolescent age groups are disproportionately represented, as Time 1 graduating seniors were not re-interviewed at follow-up. The males comprise a larger proportion of the oldest age group than females ($\chi^2 = 16.65$, $df = 2$, $p < .01$). NHW teens comprise two-thirds of the sample, with African American and Latino teens composing the next two largest race/ethnic categories. The median household income at baseline is approximately \$44,000 annually and the maximum years of parental education is approximately 14, indicating at least one parent in the household had accrued some post-secondary education. Tests of subgroup differences indicated that the average number of years of parental education was slightly higher among the boys ($t = -2.64$, $p < .05$). Over half of the sample resides in a household with both biological parents at baseline. The average level of academic achievement for these teens was modest, corresponding with a C+ based on a conventional 4.0 GPA. Subsequently bivariate analysis indicated that girls have a higher level of academic achievement in comparison to boys ($t = 10.17$, $p < .001$). Also reported on Table 1, the average levels of social support perceived from parents and the school community by these adolescents are high at each wave. Further analysis revealed that males report perceiving significantly higher levels of support from their parents than females ($t = -6.89$, $p < .001$ at Time 1 and $t = -5.67$, $p < .001$ at Time 2) conveying that boys and girls differ in the extent that they feel cared for in their proximal social environment, the family.

As described above, the final analytic sample was obtained following the application of several stringent selection criteria. A separate analysis was conducted to assess the extent to which these criteria affected the composition of the analytic sample (analysis not tabled). Overall, average symptom levels were higher among the teens excluded from the analysis at both time points ($t = 6.22$, $p < .001$ and $t = 5.07$, $p < .001$, respectively). The excluded group was comprised of slightly more males ($\chi^2 = 18.66$, $df = 1$, $p < .01$) and older teens ($\chi^2 = 3340.58$, $df = 2$, $p < .001$). The average parental education was slightly lower among the excluded group ($t = -4.99$, $p < .001$) and, in comparison to adolescents within a two-biological-parent family, fewer adolescents residing in “other” family living arrangements were retained in the analytic sample ($\chi^2 = 151.73$, $df = 1$, $p < .001$). Overall, adolescents who were excluded from the analysis reported significantly lower levels of parental support at both waves ($t = -14.12$, $p < .001$ at Time 1 and $t = -4.89$, $p < .001$ at Time 2) and school connectedness at Time 1 ($t = -8.38$, $p < .001$). These differences are likely to have some influence on the results, but are likely outweighed by the other strengths of the study,

namely, the use of multilevel modeling techniques using multiple waves of data and a nationally representative sample.

The descriptive statistics for the school-level characteristics are reported in Table 2. As described above, the socioeconomic disadvantage of the community is represented by a factor score based on four Census tract economic indicators collapsed to the school level. The school-level ethnicity variables provide an indication of the wide variation in the ethnic composition of U.S. communities. The average proportion of NHW residents in the community is high (.77), although this ranged from a minimum of .05 to .99. In contrast, the average proportion of minority residents was low; the mean proportion of African American households is .17 and the mean proportion of Latino households is .08. These proportions of minority residents also varied widely across communities (minimum = .0 and maximum = .94 for proportion of African Americans and minimum = .0 and maximum = .81 for proportion of Latinos). Overall, the average level of school connectedness perceived across schools was high (mean score = 3.60, $SD = .22$) and the level of ambient hazards perceived by the students low as indicated by high average levels of school and community safety (mean = 3.76, $SD = .33$ and 4.00, $SD = .25$, respectively).

Multilevel Analysis

The results of the hierarchical linear regression of depressive symptoms at Time 2 are presented in Table 3. The null model (Model I) indicates that the average level of symptoms varies significantly across schools ($\gamma_{00} = 8.93$, $SE = .14$, $p < .001$) and that this variation is sufficient to merit further investigation of contextual effects ($\tau_{00} = 1.55$, $p < .001$). The intraclass correlation coefficient ($\rho = .05$)⁴ more specifically indicates that a small proportion of the variation in symptomatology is attributable to the school environment.

Individual Level Effects

Model II examines the effect of gender on depressive symptoms at Time 2, controlling for baseline symptom levels. The positive and significant effect of Time 1 CES-D score suggests that depressive symptoms are quite stable over time; teens with high levels of prior symptomatology are likely to remain high relative to their peers. Moreover, the size of the intercept variance component decreases by approximately 26%, demonstrating that, although symptom levels vary across school contexts, some of the variation in depressive symptomatology is captured by the stability of symptoms and gender at the individual level.

The coefficient representing gender in Model II suggests that, on average, males report fewer depressive symptoms than females at Time 2, controlling for baseline symptoms. This model also allows the slope of the gender gap to vary across schools (which analytically translates into assigning the variable a random error term). The significant variance component ($\tau_{11} = 1.37$, $p < .001$) shows that the average difference in symptomatology between males and females varies across school contexts. That is, the gender difference is more pronounced in some school contexts as opposed to others, warranting further investigation of school characteristics that may contribute to this variation. The addition of both gender and Time 1 symptomatology significantly improves the fit of the model ($\chi^2 = 3672.43$, $df = 4$, $p < .001$).

The effects of the individual-level resource variables are included in Model III net of prior symptomatology and gender, further improving the fit of the model ($\chi^2 = 1029.48$, $df = 6$,

⁴The partitioning of the variance from both the individual and contextual levels using HLM enables estimation of the intra-class correlation coefficient Rho (ρ), or the variation in depressive symptoms across school contexts relative to the total variance in symptomatology ($\rho = \tau_{00}/(\tau_{00} + \sigma^2)$).

$p < .001$). The influence of perceived support is captured by several pieces of information: parental support and school connectedness at Time 1 and change in each support variable 1 year later. The negative and highly significant coefficients for the parental measures suggest that high levels of support are protective against emotional distress insofar as high levels of support are stable or increase over time. The perception of low parental support at Time 1 is less detrimental to adolescent mental health if the perceived relationship with parents improves over time. Comparatively low support that either decreases or remains unchanged over time increases depressive symptoms net of the other variables in the model. The coefficients obtained for school connectedness relay a similar pattern. In other words, perceived support from the family and school environments relationships is beneficial to adolescent mental health insofar as this resource is perceived to be high and consistent. A sense of diminishing closeness serves to erode any protective effects parental support and school connection may have related to depressive symptoms, a finding which is consistent with other studies investigating the association between social support and emotional distress over time (Cornwell, 2003; Wickrama & Bryant, 2003).

The addition of perceived parental support in particular affects the coefficient for gender. Separate analysis (not tabled) demonstrates that the coefficient for gender decreases with the addition of these measures, suggesting that the gap between male and female depression scores is partially attributable to differences in perceived levels of support from parents. The variance component for gender also decreases with the addition of the support variables (although it remains significant, thus warranting further investigation), suggesting that some of the variation in the gender gap across schools was accounted for with the inclusion of this key individual-level social process in the model. This finding more broadly indicates that, whereas group differences in distress are partially attributable to the larger social context, differences in perceptions of relationships in the proximal social environment—the family—is still largely influential for adolescent emotional adjustment. Further testing, however, revealed that interactions between gender and both Time 1 support and change in support between Time 1 and 2 are not statistically significant (model not tabled). Model III also illustrates that the socioeconomic resource variables—household income and parental education—are inversely related to depressive symptoms, such that symptom levels are lower among teens from families with high income and more years of education in comparison to teens from low SES families.

Model IV adjusts for age, race/ethnicity, family living arrangement, and baseline academic achievement. The effect of age was not significant in this fully adjusted model. Other studies have suggested that symptoms of emotional distress increase during different developmental stages during adolescence for boys and girls (Wight et al., 2005); further tests of the interaction between gender and age group were not significant (model not tabled). Compared with NHW teens, levels of Time 2 depressive symptoms significantly increase over time among Latino and African American teens. Contrary to patterns reported elsewhere in the literature suggesting that the gender gap in depression varies by race/ethnicity, the interaction between these two individual-level characteristics was tested and not statistically significant (model not tabled). The effect of family living situation is not significant. However, a strong negative relationship between baseline achievement and subsequent depressive symptomatology emerged, suggesting that high levels of academic achievement decrease distress over time, net of all of the other variables in the model.

Adjusting the analysis for these additional characteristics reported in Model IV affected the patterns reported previously for two of the other independent constructs. Most noticeably, the coefficient for the gender effect increased, suggesting that the difference in symptom levels between boys and girls had been suppressed before the inclusion of the other individual-level variables. The coefficients for the SES indicators each decreased slightly,

particularly after controlling for race/ethnicity. The random variance components are minimally affected when the analysis is adjusted for these sociodemographic characteristics in Model IV. This suggests that, although the inclusion of the sociodemographic characteristics improves the overall fit of the model ($\chi^2 = 60.32$, $df = 7$, $p < .001$), further analysis of the effects of school context on both the average level of depressive symptomatology and the gender gap is warranted.

School-Level Effects

The effects of the school-level variables are tested in Models V through VII. School connectedness, school safety, and neighborhood safety characterize the presence of psychosocial resources at the contextual level whereas school-level SES disadvantage captures the *lack* of economic resources. The race/ethnicity of the community (average proportion of NHW, African American, and Latino residents) assesses effect of the contextual ethnic composition on adolescent distress. First, the main effects of the school variables on the average level of depressive symptoms (i.e., the intercept) were tested in separate models. Contrary to expectations, the only school-level characteristic to approach statistical significance was SES disadvantage ($\gamma = .26$, $SE = .13$, $p = .058$) such that high levels of disadvantage increased the average level of depressive symptoms at Time 2 across schools (Model V). The addition of this school-level SES to the intercept in Model V left the intercept variance component unchanged, suggesting that accounting for contextual-level disadvantage does not explain the remaining variation in the average level of depressive symptoms across schools net of the individual-level characteristics.

Subsequently, this analysis progressed to explicating the remaining variation in the random slope for gender observed across schools with each school-level variable (i.e., cross-level interactions). As shown in Model VI in Table 3, a contingency emerges between gender and school-level SES such that the magnitude of the gender gap varies according the level of disadvantage. An illustration of this cross-level interaction is provided in Figure 1.

As shown in Figure 1, the gender gap in depressive symptomatology is quite apparent in schools characterized by low SES disadvantage, where boys have lower symptom levels on average in comparison to girls. However, as the level of disadvantage increases, the gender gap in depressive symptoms diminishes; that is, the relative socioeconomic disadvantage of school environment erodes the protective effect of male gender such that, on average, boys and girls have similar levels of psychological distress. Contrary to expectations, the mental health of the disadvantaged group—girls—is relatively unaffected by school-level SES. These results suggest that the average gender difference in depression is most pronounced in more advantaged contexts, where males as a group seem to particularly benefit. This cross-level interaction was accompanied by a decrease in the variance component for gender, suggesting that contextual-level SES plays a small role in the gender gap in depressive symptoms observed across school environments. A comparison of Model VI to IV suggests that the inclusion of this cross-level interaction presents an improvement in the fit of the overall model predicting depressive symptomatology at Time 2 ($\chi^2 = 7.15$, $df = 1$, $p < .01$).

The average gender gap in depressive symptoms was also influenced by school-level differences in perceived community safety; this contingency is illustrated in Figure 2. As seen in Figure 2, the average level of depressive symptoms among males varies according to the average level of safety perceived in the community. The highest symptom levels among males are among adolescents in schools where the perceived safety in the community is low, whereas the lowest symptom levels on average are found among those adolescent males in contexts where perceived safety is high. In comparison, the average level of depressive symptoms among females is not influenced by aggregate perceptions of community safety in

the school environment. This pattern suggests that the mental health of adolescent males in particular is sensitive to psychosocial aspects of the school community.

DISCUSSION

This study demonstrates the importance of both individual-level and school-level influences on adolescent depressive symptomatology. At the individual level, the findings obtained here confirm overall patterns demonstrated in the literature, namely, that adolescent depressive symptoms are stable over time and that females have higher levels of symptomatology relative to males. Depressive symptomatology varies across schools even after accounting for several key individual-level factors, and this aggregate variation is modestly influenced by school-level SES. This is consistent with other multilevel studies assessing the effect of compositional aspects of the environment on adolescent depressive symptomatology using the Add Health data (Goodman et al., 2003; Wight et al., 2005, 2006). The current analysis is unique in that it additionally adjusts the model for the stability of symptomatology over time whereas other models of contextual effects are cross-sectional. Previous symptoms remain the strongest predictor of depressive symptoms over time; however, the multilevel portion of this analysis demonstrates that the effect of school context on overall levels of symptomatology is robust in the face of key individual-level processes.

One of the objectives of this study was also to assess if the gender disparity in depressive symptoms was also affected by the school environment. The results of the analysis confirmed not only that the average difference between males and females varied across schools, but also differences in this “gap” in symptom levels were affected by school characteristics—specifically school SES and perceived community safety. The contingency observed between gender and school-level SES disadvantage lends support to the idea that group differences in mental health are also impacted by the social stratification of the community, although not necessarily in the direction originally hypothesized. Based on the stress process, disadvantaged groups such as females are posited to be more vulnerable than males to deleterious effects of low social status on mental health. However, these data demonstrated that boys were more affected by differences in school-level SES disadvantage than girls, confirming a relationship reported elsewhere in the literature that mental health of boys is comparatively sensitive to the effects of poverty (McLeod & Owens, 2004). The interaction observed here is more consistent with explanations of gender differences in socialization, which suggest that boys are reared to be more independent than girls. Theoretically, increased independence is likely to result in increased autonomy from the family environment and having more contact with the larger social environment. Thus, the finding that girls are less sensitive to the stresses imposed by high levels of SES disadvantage can be attributed to the idea that they are more shielded from the broader social context than boys. Similarly, this explanation can also be extrapolated to the observed contingency between gender differences in distress and perceived safety. As they are socialized to be more independent, boys have more opportunity to perceive ambient hazards in the social environment as they spend more time outside the family sphere. Perceptions of environmental hazards, in turn, have been linked to higher rates of psychological distress (Aneshensel & Sucoff, 1996).

These findings also suggest that other sources of stress beyond SES differences may be implicated in the gender disparity in depressive symptoms. The pattern demonstrated by these results does not diminish the fact that females have a higher level of symptoms than males across all school environments, and that girls in environments characterized by less SES disadvantage do not seem to be deriving the same benefits from the resources provided by socioeconomically advantaged communities as their male peers. Future analysis is

needed to explore the mechanisms guiding this effect more fully, particularly in relation to the intrapersonal processes (e.g., self-esteem and mastery) suggested by the stress models (Way & Robinson, 2003).

Parental and school support were quite consequential to mental health at the individual level, confirming the finding that perceived supportiveness from others in the immediate social environments is salient to the development of psychological health in the adolescent years (Robinson & Garber, 1995). A caveat emerges for this protective effect in that support is only beneficial to adolescent mental health if it is perceived as consistent or improving over time, as reported elsewhere (Cornwell, 2003). This analysis also suggests that the gender difference in depression is not fully accounted for by the support constructs suggested by the stress models. Models that are more specific to adolescents are needed in order to obtain a more comprehensive understanding of the effects of social location, social resources, and the etiology of depression early in the lifecourse.

The lack of a significant effect for school connectedness observed here was unexpected and contradicts reports from studies of the effects of neighborhood social cohesion on mental health (Sampson et al., 2002; Wickrama & Bryant, 2003). This study included a more comprehensive set of individual-level controls (e.g., baseline symptoms and change in perceived family support) in comparison to previous work. In light of the individual-level association between support and symptomatology, the lack of a relationship between school connectedness and symptoms suggests that the more proximal indicator of social capital is more consequential to adolescent mental health (Bearman & Burns, 1998; Duncan, Boisjoly, & Harris, 2001) and illustrates the need to control for individual-level processes when examining contextual effects as suggested by Jencks and Mayer (1990). Furthermore, the mechanisms through which schools influence mental health may be more circuitous than the descriptive findings reported in other multilevel studies.

Although technical advances have greatly enhanced our ability to analytically model the impact of the environment on a variety of health outcomes, several key methodological and conceptual challenges to conducting this type of research remain. For instance, measurement of community resources, particularly more intangible concepts such as school connectedness, is difficult. Aggregating reports of school connectedness may be an inadequate proxy for assessing the collective effects of community support experienced by adolescents within schools. Similarly, measures of the school climate derived from the Census may also fail to fully capture the aspects of the social environment that are consequential to individual health (Duncan et al., 2001; Leventhal & Brooks-Gunn, 2000). Issues of endogeneity further qualify these findings. That is, the decision to attend a specific school is correlated with unobserved factors that are not included in the analysis but may nonetheless affect each outcome, thus potentially biasing results. Another limitation of this work that merits attention is the use of Census tract data to create a proxy of indicator of school-level SES. This approach assumes that there is concordance between the Census tract in which the adolescents reside and the school they attend, when in fact there are other factors such as out-of-district busing or parochial school attendance that result in adolescents attending schools that have little in common with their tract. This limitation reflects a common problem posed by relying on Census information for objective indicators of community characteristics and the need for future studies that are specifically designed for multilevel analysis of communities.

One of the major strengths of this study is the use of data from a large, nationally representative sample. However, the generalizability of these findings is limited by the fact that Add Health is a school-based sample. Thus, findings may only be extrapolated to American adolescents who attend school; inferences cannot be made for teens who are

home-schooled, institutionalized, or have dropped out. Another strength of this analysis is the focus on the school as a community in light of the frequent use of neighborhoods as the social context investigated by multilevel studies. The use of neighborhoods is conceptually problematic, particularly when using a nationally representative sample. Such samples incorporate participants from rural, suburban, and urban locales. It is likely that definitions and boundaries of communities vary considerably by degree of urbanization whereas the experience of schools, both physically and socially, is fairly universal. Also, this study takes the position that in addition to reflecting the communities in which they are situated, schools are adolescent communities with a distinct culture and social structure (Coleman, 1961). In addition to the substantive considerations of this analysis of school context, the hierarchical structure of the Add Health dataset necessitated a multilevel approach. However, it deserves mention that these adolescents also cluster into other organizational structures such as classrooms that were beyond the scope of this analysis.

Although this investigation emphasized contextual effects, the added dimension of time to the analysis represents a substantial advantage of the present work relative to other multilevel analyses, which are largely cross-sectional. In particular, this analysis yielded that the modest variation in depressive symptomatology across school contexts withstands the robust effect for symptom stability at the individual-level across two waves of data. Although the availability of perceived parental support data from two timepoints permitted analysis of the dynamics involved in the relationship between support and symptoms, repeated measures of the other focal constructs (i.e., family income, school socioeconomic disadvantage, and school connectedness) were not available. Other research has suggested that multilevel studies need to address the possibility that environments such as schools have effects that accumulate and compound over time (Coleman, 1961; Duncan et al., 2001; Wheaton & Clarke, 2003).

The presence of contextual effects over and above individual-level risk factors in the risk for psychological distress indicates that the integration of population and individual health is substantively advantageous. Particularly, the contingency between both school-level SES disadvantage and perceived safety and gender in depressive symptomatology illustrates the need for multidimensional and multilevel approaches to understanding and eventually reconciling health disparities. On a more practical level, analysis of contextual effects of schools on adolescent mental health is imperative given that much of the adolescent research is school-based and subsequent findings are used to develop and implement policies and interventions that are frequently implemented within these institutions. Thus, further consideration for the effects of social context is needed, particularly during the adolescent period of the lifecourse when individuals may be most amenable to the prevention of further distress and dysfunction.

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REFERENCES

- Anderman EM. School effects on psychological outcomes during adolescence. *Journal of Educational Psychology*. 2002; 94:795–809.
- Aneshensel CS. Social stress: Theory and research. *Annual Review of Sociology*. 1992; 18:15–38.
- Aneshensel CS, Rutter CM, Lachenbruch PA. Social structure, stress, and mental health: Competing conceptual and analytic models. *American Sociological Review*. 1991; 56:166–178.
- Aneshensel CS, Sucoff CA. The neighborhood context of adolescent mental health. *Journal of Health and Social Behavior*. 1996; 37:293–310. [PubMed: 8997886]
- Avison W, McAlpine D. Gender differences in symptoms of depression among adolescents. *Journal of Health and Social Behavior*. 1992; 33:77–96. [PubMed: 1619265]
- Barber BK, Olsen JA. Socialization in context: Connection, regulation, and autonomy in the family, school, and neighborhood, and with peers. *Journal of Adolescent Research*. 1997; 12:287–315.
- Bearman PS, Burns LJ. Adolescents, health, and school: Early analyses from the National Longitudinal Study of adolescent health. *NASSP Bulletin*. 1998; 82:1–12.
- Bearman, PS.; Jones, J.; Udry, JR. The national longitudinal study of adolescent health: Research design. 1997. Retrieved August 21, 2002, from <http://www.cpc.unc.edu/addhealth>
- Birmaher B, Ryan N, Williamson D, Brent D, Kaufman J, Dahl R, et al. Childhood and adolescent depression: A review of the past 10 years. Part 1. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1996; 35:1427–1439. [PubMed: 8936909]
- Bronfenbrenner, U. Experiments by nature and design. Harvard University Press; Cambridge, MA: 1979. The ecology of human development.
- Chantala, K.; Tabor, J. Strategies to perform a design-based analysis using the Add Health data. University of North Carolina at Chapel Hill; 1999. Retrieved August 21, 2002, from <http://www.cpc.unc.edu/projects/addhealth/data/using/guides/weight1.pdf>
- Cheung S-K. Self-discrepancy and depressive experiences among chinese early adolescents: Significance of identity and the undesired self. *International Journal of Psychology*. 1997; 32:347–359.
- Cicchetti, D.; Toth, S. Developmental psychopathology and disorders of affect. In: Cicchetti, D.; Cohen, DJ., editors. *Developmental psychopathology, volume 1: Theory and methods*. J. Wiley; New York: 1995.
- Colarossi LG, Eccles JS. Differential effects of support providers on adolescents' mental health. *Social Work Research*. 2003; 27:19–30.
- Coleman, JS. The adolescent society. The Free Press; New York: 1961.
- Compas BE, Hinden BR, Gerhardt CA. Adolescent development: Pathways and processes of risk and resilience. *Annual Review of Psychology*. 1995; 46:265–293.
- Cornwell B. The dynamic properties of social support: Decay, growth, and staticity, and their effects on adolescent depression. *Social Forces*. 2003; 81:953–978.
- Costello EJ, Compton SN, Keeler G, Angold A. Relationships between poverty and psychopathology. *Journal of the American Medical Association*. 2003; 290:2023–2029. [PubMed: 14559956]
- Costello EJ, Mustillo S, Erkanli A, Keeler G, Angold A. Prevalence and development of psychiatric disorders in childhood and adolescence. *Archives of General Psychiatry*. 2003; 60:837–844. [PubMed: 12912767]
- Crosnoe R, Muller C. Body mass index, academic achievement, and school context: Examining the educational experiences of adolescents at risk for obesity. *Journal of Health and Social Behavior*. 2004; 45:393–407. [PubMed: 15869112]
- Cutrona CE, Wallace G, Wesner KA. Neighborhood characteristics and depression. *Current Directions in Psychological Science*. 2006; 15:188–192. [PubMed: 18185846]
- Cyranowski JM, Frank E, Young E, Shear MK. Adolescent onset of the gender difference in lifetime rates of major depression. *Archives of General Psychiatry*. 2000; 57:21–27. [PubMed: 10632229]

- Diez-Roux A. Bringing context back into epidemiology: Variables and fallacies in multilevel analysis. *American Journal of Public Health*. 1998; 88:216–222. [PubMed: 9491010]
- DuBois DL, Burk-Braxton C, Swenson LP, Tevendale HD, Hardesty J. Race and gender influences on adjustment in early adolescence: Investigation of an integrative model. *Child Development*. 2002; 73:1573–1592. [PubMed: 12361320]
- Duncan GJ, Boisjoly J, Harris KM. Sibling, peer, neighbor, and schoolmate correlations as indicators of the importance of context for adolescent development. *Demography*. 2001; 38:437–447. [PubMed: 11523270]
- Eamon MK. Influences and mediators of the effect of poverty on young adolescent depressive symptoms. *Journal of Youth and Adolescence*. 2002; 31:231–242.
- Elder GH, Conger RE, Foster EM, Ardel M. Families under economic pressure. *Journal of Family Issues*. 1992; 13:5–37.
- Glantz MD, Leshner AI. Drug abuse and developmental psychopathology. *Development and Psychopathology*. 2000; 12:795–814. [PubMed: 11202044]
- Goodman E, Huang B, Wade TJ, Kahn RS. A multilevel analysis of the relation of socioeconomic status to adolescent depressive symptoms: Does school context matter? *The Journal of Pediatrics*. 2003; 143:451–456. [PubMed: 14571218]
- Gore S, Aseltine RH, Colton ME. Social structure, life stress and depressive symptoms in a high school-aged population. *Journal of Health and Social Behavior*. 1992; 33:97–113. [PubMed: 1619266]
- Hammen CL, Rudolph K, Weisz J, Rao U, Burge D. The context of depression in clinic-referred youth. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1999; 38:64–71. [PubMed: 9893418]
- Jacobson KC, Rowe DC. Genetic and environmental influences on the relationships between family connectedness, school connectedness, and adolescent depressed mood: Sex differences. *Developmental Psychology*. 1999; 35:926–939.
- Jencks, C.; Mayer, SE. The social consequences of growing up in a poor neighborhood. In: Lynn, LE.; McGeary, MGH., editors. *Inner-city poverty in the United States*. National Academy Press; Washington, DC: 1990. p. 111-186.
- Johnson MK, Crosnoe R, Elder GH. Students' attachment and academic engagement: The role of race and ethnicity. *Sociology of Education*. 2001; 74:318–340.
- Johnson MK, Crosnoe R, Thaden LL. Gendered patterns in adolescents' school attachment. *Social Psychology Quarterly*. 2006; 69:284–295.
- Kandel DB, Davies M. Adult sequelae of adolescent depressive symptoms. *Archives of General Psychiatry*. 1986; 43:225–262.
- Kessler RC, Avenevoli S, Merikangas KR. Mood disorders in children and adolescents: An epidemiologic perspective. *Biological Psychiatry*. 2001; 49:1002–1014. [PubMed: 11430842]
- Kessler RC, Walters EE. Epidemiology of DSM-III-R major depression and minor depression among adolescents and young adults in the National Comorbidity Survey. *Depression and Anxiety*. 1998; 7:3–14. [PubMed: 9592628]
- Lee VE. Using hierarchical linear modeling to study social contexts: The case of school effects. *Educational Psychologist*. 2000; 35:125–141.
- Lee VE, Bryk AS. A multilevel model of the social distribution of high school achievement. *Sociology of Education*. 1989; 62:172–192.
- Lee VE, Marks HM, Byrd T. Sexism in single-sex and coeducational independent secondary school classrooms. *Sociology of Education*. 1994; 67:92–120.
- Lee VE, Smith JB, Croninger RG. How high school organization influences the equitable distribution of learning in mathematics and science. *Sociology of Education*. 1997; 70:128–150.
- Leventhal T, Brooks-Gunn J. The neighborhoods they live in: The effects of neighborhood residence on child and adolescent outcomes. *Psychological Bulletin*. 2000; 126:309–337. [PubMed: 10748645]
- Lewinsohn P, Rohde P, Klein D, Seeley J. Natural cause of adolescent major depressive disorder: I. Continuity into young adulthood. *Journal of American Academy of Child and Adolescent Psychiatry*. 1999; 38:56–63.

- Loukas A, Robinson S. Examining the moderating role of perceived school climate in early adolescent adjustment. *Journal of Research on Adolescence*. 2004; 14:209–233.
- McLeod JD, Owens TJ. Psychological well-being in the early life course: Variations by socioeconomic status, gender, and race/ethnicity. *Social Psychology Quarterly*. 2004; 67:257–278.
- McNeely CA, Nonnemaker JM, Blum RW. Promoting school connectedness: Evidence from the National Longitudinal Study of Adolescent Health. *Journal of School Health*. 2002; 72:138–146. [PubMed: 12029810]
- Mirowsky J. Age and gender gap in depression. *Journal of Health and Social Behavior*. 1996; 37:362–380. [PubMed: 8997891]
- Nolen-Hoeksema S. Gender differences in depression. *Current Directions in Psychological Science*. 2001; 10:173–176.
- Nolen-Hoeksema S, Girgus JS. The emergence of gender differences in depression during adolescence. *Psychological Bulletin*. 1994; 115:424–443. [PubMed: 8016286]
- Pearlin LI. The sociological study of stress. *Journal of Health and Social Behavior*. 1989; 30:241–256. [PubMed: 2674272]
- Radloff LS. The CES-D Scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*. 1977; 1:385–401.
- Raudenbush, SW.; Bryk, AS. Hierarchical linear models. Applications and data analysis methods. 2nd ed.. Sage Publications; Thousand Oaks, CA: 2002.
- Raudenbush, SW.; Bryk, AS.; Congdon, R. HLM for windows version 6.01. Scientific Software International, Inc; Lincolnwood, IL: 2005.
- Reinherz HZ, Giaconia RM, Lefkowitz ES, Pakiz B, Frost AK. Prevalence of psychiatric disorders in a community of population of older adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1993; 32:369–377. [PubMed: 8444767]
- Resnick MD, Bearman P, Blum RW, Bauman KE, Harris KM, Jones J, et al. Protecting adolescents from harm: Findings from the National Longitudinal Study of Adolescent Health. *Journal of the American Medical Association*. 1997; 278:823–832. [PubMed: 9293990]
- Roberts RE. Depressive symptoms and suicidal ideation among Mexican-origin and Anglo adolescents. *Journal of American Academy of Child and Adolescent Psychiatry*. 1995; 34:81–90.
- Robinson, NS.; Garber, J. Social support and psychopathology across the life span. In: Cicchetti, D.; Cohen, DJ., editors. *Developmental psychopathology, Vol. 1: Theory and methods*. J. Wiley; New York: 1995.
- Rosenfield S, Vertefuille J, McAlpine DD. Gender stratification and mental health: An exploration of dimensions of the self. *Social Psychology Quarterly*. 2000; 63:208–223.
- Ross CE. Neighborhood disadvantage and adult depression. *Health and Social Behavior*. 2000; 41:177–187.
- Ross CE, Broh BA. The roles of self-esteem and the sense of personal control in the academic achievement process. *Sociology of Education*. 2000; 73:270–284.
- Sampson RJ, Morenoff JD, Gannon-Rowley T. Assessing “neighborhood effects”: Social processes and new directions in research. *Annual Review of Sociology*. 2002; 28:443–478.
- Sampson RJ, Raudenbush SW, Earls F. Neighborhoods and violent crime: A multilevel study of collective efficacy. *Science*. 1997; 277:918–924. [PubMed: 9252316]
- Schraedley PK, Gotlib IH, Hayward C. Gender differences in correlates of depressive symptoms in adolescents. *Journal of Adolescent Health*. 1999; 25:98–108. [PubMed: 10447037]
- Silver E, Mulvey EP, Swanson JW. Neighborhood structural characteristics and mental disorder: Faris and Dunham revisited. *Social Science and Medicine*. 2002; 55:1457–1470. [PubMed: 12231022]
- StataCorp. Stata statistical software: Release 8.0. Stata Corporation; College Station, TX: 2003.
- Torsheim T, Wold B. School-related stress, support, and subjective health complaints among early adolescents: A multilevel approach. *Journal of Adolescence*. 2001; 24:701–713. [PubMed: 11790051]
- Wadsworth ME, Compas BE. Coping with family conflict and economic strain: The adolescent perspective. *Journal of Research on Adolescence*. 2002; 12:243–274.

- Way N, Robinson MG. A longitudinal study of the effects of family, friends, and school experiences on the psychological adjustment of ethnic minority, low-SES adolescents. *Journal of Adolescent Research*. 2003; 18:324–346.
- Wheaton B, Clarke P. Space meets time: Integrating temporal and contextual influences on mental health in early adulthood. *American Sociological Review*. 2003; 68:680–706.
- Wichstrøm L. The emergence of gender difference in depressed mood during adolescence: The role of intensified gender socialization. *Developmental Psychology*. 1999; 35:232–245. [PubMed: 9923478]
- Wickrama KAS, Bryant CM. Community context of social resources and adolescent mental health. *Journal of Marriage and Family*. 2003; 65:850–866.
- Wight RG, Aneshensel CS, Botticello AL, Sepulveda JE. A multilevel analysis of ethnic variation in depressive symptoms among adolescents in the United States. *Social Science and Medicine*. 2005; 60:2073–2084. [PubMed: 15743655]
- Wight RG, Botticello AL, Aneshensel CS. Socioeconomic context, social support, and adolescent mental health: A multilevel investigation. *Journal of Youth and Adolescence*. 2006; 163:1071–1078.
- Wight RG, Sepulveda JE, Aneshensel CS. Depressive symptoms: How do adolescents compare with adults? *Journal of Adolescent Health*. 2004; 34:314–323. [PubMed: 15041001]

FIGURE 1.
Cross-level interaction between gender and school-level socioeconomic disadvantage.

FIGURE 2.
Cross-level interaction between gender and school-level community safety.

TABLE 1

Descriptive Statistics for Individual-Level Characteristics, Two-Wave Sample^a

	<i>Total Sample</i> <i>N = 9,709</i>	<i>Females</i> <i>N = 5,017</i>	<i>Males</i> <i>N = 4,692</i>
<i>Dependent variable (Mean [SE])</i>			
CES-D (T1)	9.08(.14)	9.93(.16)	8.18(.16) ***
CES-D (T2)	8.99(.14)	9.80(.15)	8.15(.19) ***
<i>Demographic control variables</i>			
Baseline age group (%)			
11–14	45.87	46.80	44.90
15–16	39.71	40.20	39.20
17+	14.42	13.00	15.90 **
Race (%)			
Non-Hispanic White (NHW)	67.75	67.86	67.64
African American	15.17	15.84	14.48
Latino	11.57	11.49	11.65
Asian Pacific Islander (API)	3.94	3.42	4.49
Other	1.57	1.40	1.75
Baseline socioeconomic status (Mean [SE])			
Baseline household income (\$1000s)	44.33(1.78)	43.86(1.76)	44.81(1.98)
Parental education (years)	13.69(.11)	13.60(.11)	13.79(.11) *
Family composition (%)			
Two biological parents	59.38	59.38	59.39
Other	40.62	40.62	40.61
Baseline academic achievement (Mean [SE])	2.83(.02)	2.93(.03)	2.72(.03) ***
<i>Psychosocial control variables</i>			
Parental support (T1)	4.30(.01)	4.21(.02)	4.39(.01) ***
Parental support (T2)	4.20(.01)	4.12(.02)	4.28(.02) ***
School connectedness (T1)	3.81(.02)	3.81(.02)	3.82(.02)
School connectedness (T2)	3.76(.02)	3.73(.02)	3.78(.02)

Notes.

Chi-square tests of significance used to test differences between group proportions.

T-tests used to test differences between group means.

^a All analyses weighted to adjust for sample design effects.*
 $p < .05$;**
 $p < .01$;***
 $p < .001$.

TABLE2Descriptive Statistics for School-Level Characteristics ($N = 127$)

	<i>Mean (SD)</i>
Compositional variables	
Socioeconomic disadvantage	-.01 (.80)
Proportion Non-Hispanic White	.77 (.23)
Proportion African American	.17 (.21)
Proportion Latino	.08 (.13)
Psychosocial variables	
Perceived school cohesion	3.60 (.22)
Perceived school safety	3.76 (.33)
Perceived community safety	4.00 (.25)

TABLE3

Hierarchical Linear Regressions of Depressive Symptoms at $T2$ ($B[SE]$)

	<i>Model</i>						
	<i>I</i>	<i>II</i>	<i>III</i>	<i>IV</i>	<i>V^a</i>	<i>VI^a</i>	<i>VII^a</i>
<i>Individual-level variables</i>							
CES-D 16 ($T1$)		.56 (.02) ***	.48 (.02) ***	.46 (.01) ***	.46 (.02) ***	.46 (.02) ***	.46(.02) ***
Male		-.76 (.16) ***	-.56 (.14) ***	-.80 (.15) ***	-.80 (.15) ***	-.80 (.14) ***	-.80(.14) ***
Parental support ($T1$)			-1.38 (.15) ***	-1.34 (.15) ***	-1.34 (.16) ***	-1.35 (.15) ***	-1.35(.15) ***
Parental support $\delta(T1 - T2)$			-1.92 (.16) ***	-1.90 (.15) ***	-1.91 (.15) ***	-1.90 (.15) ***	-1.91(.15) ***
School connectedness ($T1$)			-.96 (.12) ***	-.86 (.12) ***	-.87 (.12) ***	-.87 (.12) ***	-.86(.12) ***
School connectedness $\Delta(T1 - T2)$			-1.26 (.12) ***	-1.20 (.11) ***	-1.20 (.11) ***	-1.20 (.11) ***	-1.20(.11) ***
Logged family income ($T1$)			-.47 (.09) ***	-.31 (.09) **	-.28 (.09) **	-.29 (.09) **	-.30(.09) **
Parental education			-.17 (.03) ***	-.10 (.03) **	-.10 (.03) **	-.10 (.03) **	-.10(.03) **
Age 15–16 years ^b				.03 (.18)	.04 (.18)	.03 (.18)	.02(.18)
Age 17+ years ^b				.13 (.23)	.14 (.23)	.14 (.23)	.13(.23)
Latino ^c				1.01 (.28) **	.98 (.28) **	.99 (.28) **	.95(.28) **
African American ^c				.56 (.24) *	.47 (.25) †	.49 (.24) *	.52(.24) *
Asian Pacific Islander ^c				.67 (.45)	.66 (.45)	.67 (.45)	.61(.45)
Other ethnicity ^c				.67 (.57)	.63 (.57)	.64 (.57)	.61(.57)
Two biological parents				-.16 (.15)	-.16 (.15)	-.16 (.15)	-.15(.15)
Achievement				-.82 (.12) ***	-.82 (.12) ***	-.82 (.12) ***	-.82(.12) ***
Intercept	8.93 (.14) ***	4.29 (.21) ***	18.24 (1.04) ***	18.62 (1.13) ***	18.54 (1.33) ***	18.60 (1.13) ***	18.63(1.13) ***
<i>School-level variables</i>							
SES disadvantage					.26 (.14) †	—	—
<i>Cross-level interactions</i>							
Male χ SES Disadvantage						.35 (.13) **	—
Male χ Neighborhood Safety							-1.04 (.36) **
<i>Random variance components</i>							
Intercept	1.55 ***	1.55 ***	.98 ***	1.00 ***	1.02 ***	.99 ***	1.00 ***
Male		1.37 ***	.97 ***	.96 ***	.97 ***	.90 ***	.79 ***
<i>Comparison to previous model</i>							
Chi-square	—	3672.43 ***	1029.48 ***	143.94 ***	4.97 *	7.15 **	5.98 *
Degrees of freedom		4	6	8	1	1	1

Notes. SES = socioeconomic status.

^aCompared with Model IV.

^bReference group is age 11–14 years.

^cReference group is Non-Hispanic White.

[†]
 $p < .10$

^{*}
 $p < .05$

^{**}
 $p < .01$

^{***}
 $p < .001$.