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Maternal Depressive Symptoms and Adolescent Health Risk Problems: The Role of School Engagement

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Abstract

Maternal depressive symptoms disrupt positive youth development, though the pervasiveness of this disruption is understudied. Additionally, it remains unknown whether prosocial factors such as adolescent school engagement may buffer against this risk factor. Using multigenerational, longitudinal data spanning ten years from an ethnically diverse sample of mother-child dyads (66% Black, 17% Hispanic, and 17% White), this study examines the effect of maternal depressive symptoms in late childhood (ages 8–13) on the development and progression of offspring depressive symptoms, substance use, and delinquent behavior during adolescence (ages 14–17). Further, the study examines whether school engagement moderates the ill effects of maternal depressive symptoms. Mother-son ($n=212$) and mother-daughter ($n=215$) dyads are compared to assess for similarities and differences between male and female offspring. The results indicate that offspring of mothers with greater maternal depressive symptoms are more likely to display higher levels of depressive symptoms, substance use, and delinquency throughout adolescence, although important nuances emerge across outcome and child sex. Additionally, while school engagement itself is associated with reduced depressive symptoms, substance use and delinquency among adolescents, it is not profound enough to offset the risk posed by maternal depressive symptoms. The findings of this study reinforce the pervasive, negative, intergenerational impact of maternal depressive symptoms and has implications for prevention and intervention efforts for adolescent health risk problems.

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Authors' Contributions

CF conceived of the study, participated in its design and coordination, and drafted the manuscript; MBA conceived of the study, participated in the study design and coordination, performed the measurement and statistical analysis, and helped draft the manuscript; KH conceived of the study, participated in its design and interpretation of the data, and helped to draft the manuscript. All authors read and approved the final manuscript.

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Conflicts of Interest

The authors declare that they have no conflict of interest.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Additionally, all research conducted was in compliance with the research procedures set forth by the University at Albany.

Keywords

depressive symptoms; substance use; delinquency; school engagement

Introduction

Exposure to maternal depressive symptoms imparts heightened risk of maladaptive symptoms and behaviors during adolescence, which, in turn, can negatively impact subsequent development. Identifying the ways in which risk and protective factors interact to result in health risk problems during adolescence is critical for public health efforts that seek to offset risk and/or interrupt involvement in problem behaviors or internalized distress. Unfortunately, little research examines whether exposure to maternal depressive symptoms during offspring's late childhood and early adolescence (as opposed to infancy or early childhood) poses a significant risk for future problem behaviors in adolescence. Moreover, it remains unknown whether well-known prosocial factors have the capacity to offset the risk incurred from having a mother who displays depressive symptoms during late childhood and early adolescence. Recognizing both of these limitations in extant research, the present study examines the relationship between exposure to maternal depressive symptoms in late childhood and early adolescence on the development of three health risk problems of the child that negatively affect individual health and functioning – depressive symptoms, substance use, and delinquency. Then, building on the robust literature that documents the positive role of school engagement on healthy development, this work examines whether school engagement can buffer the ill effect of youth's exposure to maternal depressive symptoms on adolescent functioning and behavior, presumably via the positive socialization associated with the school context.

Adolescent Health Risk Problems

Depressive symptoms, substance use, and delinquent behavior are three commonly co-occurring problems that frequently manifest and intensify during adolescence and compromise individual health and functioning (see Schuler, Vasilenko & Lanza, 2015; Beyers & Loeber, 2003). Due to the numerous negative consequences, each is considered to be a major public health concern (Patel et al., 2016; Cohen & Piquero, 2009). Depressive symptoms during adolescence substantially increase contemporaneous and future individual, interpersonal, economic, and emotional difficulties (Copeland, Wolke, Shanahan & Costello, 2015), and suicide resulting from a depressive episode is currently the second leading cause of mortality for 15–24 year-olds (Heron, 2018). Adolescent substance use is also cause for concern, due to its association with injury, sexual assault, and/or death (NIAAA, 2006), as well as poor school performance, lower educational attainment, and lifelong alcohol/marijuana use dependence/disorders (Flory, Lynam, Milich, Leukefeld & Clayton, 2004; Miller, Naimi, Brewer & Jones, 2007). Additionally, delinquent behavior during adolescence not only leads to victimization (people and property) but it also incurs tax dollars as a result of the potential involvement of police and correctional agencies (Welsh et al., 2008). Delinquency also connotes a lasting disruption to individual pathways to health and success in adulthood (Evans, Simons & Simons, 2016), resulting in economic underachievement and

unemployment, alcohol and/or drug abuse, and early sexual activity and pregnancy (Bradshaw, Schaeffer, Petras & Ialongo, 2010; Carter, 2019).

Prevention and intervention efforts depend upon knowledge regarding the etiological origins of health risk problems, including shared etiologies, in order to effectively prevent the associated consequences. It is well-established that exposure to maternal depressive symptoms increases an adolescent's risk for depressive symptoms, substance use, and delinquent behavior (e.g., Brennan et al., 2000; Campbell, Morgan-Lopez, Cox & McLoyd, 2009; Gajos & Beaver, 2017; Mikkonen, Moustgaard, Remes, & Martikainen, 2016). Maternal depressive symptoms impair an individual's ability to effectively parent in various ways, including via maternal intrusiveness (Gustafsson & Cox, 2012), inattentiveness/unresponsiveness (Gelfand & Teti, 1990), child rejection, and inconsistent discipline (Zalewski, Thompson & Lengua, 2017). These behaviors, in turn, predict mental health problems (depressive symptoms) in adolescent offspring (Ahun et al., 2018). Negative or permissive maternal parenting behaviors (see Hoeve, et al., 2011) or maternal inattention associated with a maternal history of depressed mood (e.g., Brook et al, 1988) also increase the likelihood of substance misuse and delinquent behavior (Mason, Chmelka, Trudeau, & Spoth, 2017; Wickham et al., 2015; Pilowsky et al., 2006) in offspring. In short, maternal depressive symptomology critically compromises prosocial socialization by one's mother, who tends to be the primary caregiver in Western societies.

When addressing the etiology of adolescent mental health and health risk behaviors, as well as the intergenerational effects of any health-risk problem, it is important to acknowledge sex differences in both genetic and environmental factors that convey risk, protect against adverse outcomes, or promote resilience (e.g., Nolen-Hoeksema & Hilt, 2006; Jacobsen & Rowe, 1999). As such, maternal factors may differentially affect offspring mental health and behavior due to biological sex symmetry or asymmetry (i.e., genetic), different socialization patterns across child sex (i.e., mothers may differentially parent children across biological sex; Mesman & Groeneveld, 2018), or different thresholds of risk that affect the likelihood of subsequent symptomology or health risk problem (e.g., Rebellon et al., 2017; Smith & Paternoster, 1987). Thus, it is also important to assess for sex differences in health risk problems as well as potential sex differences in the etiological origins underscoring involvement in health risk problems. Furthermore, the timing of exposure to maternal depressive symptoms appears to play an important role as well, with increasing ill effects through adolescence (Augustyn, Fulco & Henry, 2018). Therefore, it is important to build upon extant research and examine whether the risk posed by maternal depressive symptoms negatively affects a range of adolescent health risk problems similarly for sons and daughters while accounting for the timing of the adolescent health problems. Notably, there is a dearth of research that addresses the risk incurred by maternal depressive symptoms during late childhood and early adolescence. This focus is informative because late childhood through the onset of adolescence is a key period of the life course when socialization by one's family is pronounced in effect.

The Search for Protective Factors to Promote Resilience to Maternal Depressive Symptoms

According to primary socialization theory (PST; Oetting & Donnermeyer, 1998), adolescent behavior is learned within the three primary domains of socialization: family, peers, and school. In the context of maternal depressive symptoms, healthy adolescent development may be compromised as a result of factors within the family domain (e.g., parental sensitivity, permissiveness, attitudes), leading to engagement in risky behavior or an unhealthy internalization of stressors (thereby increasing depressive symptomatology). The family can serve as a protective and promotive factor for health risk problems as well. For instance, extant research identifies various maternal and paternal parenting behaviors (e.g., maternal warmth, consistent discipline) as protective factors, reducing the likelihood of offspring depressive symptoms, substance use and delinquency. Moreover, positive parenting behaviors also serve as a promotive factor, moderating the link between maternal depressive symptoms and adolescent health risk problems (e.g., Kuckertz, Mitchell & Wiggins, 2018; Luthar & Sexton, 2007). Unfortunately, much less is known about child factors that may buffer the ill effects of maternal depressive symptoms. More specifically, little is known regarding the role of protective factors stemming from positive socialization within other socialization domains, including the school environment, and whether these promotive factors have the capacity to offset the robust risk associated with maternal depression.

Peers are one source of socialization that have the potential to promote engagement in both healthy and deviant/unhealthy behavior, depending on peer characteristics and situational context (Warr, 2002). On the other hand, Oetting and Donnermeyer (1998) posited that socialization derived from school is more likely to reliably promote prosocial norms and goals (i.e., academic involvement and success), which are incompatible with health risk problems in adolescents. Furthermore, stronger bonds between the child and school decrease the likelihood that a youth will socialize with deviant peers, which often results in deviant/antisocial behaviors (Haynie & Osgood, 2005). Extant research consistently documents that engagement with school (e.g., including academic commitment and sense of belonging at school) is associated with health-promoting behaviors and positive outcomes that extend throughout the life course (Pate, Maras, Whitney & Bradshaw, 2017; Bonell et al., 2017).

The school context plays a large and important role in adolescent development given the proportion of time a youth spends in a school setting. A student's relationship to school (or school engagement) consists of various constructs including commitment, participation, and attachment (Libbey, 2004). School commitment reflects the individual value placed on educational goals (Jenkins, 1995). This value, in turn, is predictive of student investment and involvement in academic pursuits (i.e., good grades and educational attainment). School attachment reflects an affinity for one's educational institution and can provide a source of belonging. In turn, this attachment is often a source of social support for youth. Both attachment and commitment to school foster reciprocal expectations with prescriptions for normative (i.e., prosocial) behavior and a positive social identity, and they can provide emotional, informational, and instrumental support (Malecki and Demaray; 2002). Interestingly, though, some sex differences emerge in school engagement, including greater behavioral and emotional connectedness among girls. On the other hand, cognitive

engagement, defined by learning strategies and self-evaluation in school, is more uniform in prevalence across sex (Wang, Willett & Eccles, 2011).

Given that school engagement serves as a source of support for a youth, it is not surprising that school engagement is negatively related to a variety of health risk problems in adolescence, including depressive symptoms (Pate, Maras, Whitney & Bradshaw, 2017), substance use (Catalano, Oesterle, Fleming & Hawkins, 2004), and delinquency (Lee & Smith-Adcock, 2005). For example, Bond and colleagues (2007) found that adolescents with greater school engagement (including commitment and sense of belonging at school) were less likely to experience depressive symptoms or use illicit substance. Similarly, Joyce and Early (2014) found evidence of fewer depressive symptoms in adolescents who felt more connected to school. Academic commitment is also associated with a lower likelihood of problematic alcohol use and/or dependence (e.g., Bonell et al., 2017; Guo, Hawkins, Hill & Abbott, 2001), as well as lower rates of delinquency (Maguin & Loeber, 1996).

Although evidence suggesting the positive effects of school engagement on adolescent health and behavior are robust, additional research is needed. First, more work is needed to examine whether school engagement functions differentially across child sex in terms of its effects on positive development, given that it may take different forms (i.e., behavioral alignment vs. cognitive engagement) across sex. Additionally, given the robust effects of school engagement on positive youth development, it is worthwhile to examine whether school engagement can offset the risk posed by other domains of socialization, including the family. In particular, school engagement may provide a source of social support and identity that may be lacking in a youth whose familial socialization was compromised in the context of maternal depression, thus weakening the ill effects of maternal depressive symptoms on offspring depressive symptoms and health risk behaviors.

Current study

A large body of literature demonstrates that maternal depressive symptoms pose a significant risk for adolescent development. The first goal of this work is to extend previous research and confirm the intergenerational effect of maternal depressive symptoms across an array of adolescent health risk problems using prospective, longitudinal data spanning ten years from a diverse sample of mother-child dyads (predominantly African-American and Latino).¹ More specifically, this study examines how the scope of maternal depressive symptoms in late childhood and early adolescence affects the sequelae of depressive symptoms, substance use, and delinquency from child ages 14 to 17. In addressing this aim, this study explores whether the effect of maternal depressive symptoms in late childhood and early adolescence varies in strength across adolescence. Next, the effects of school engagement on the same three outcomes are examined. In line with extant research, it is expected that school engagement is negatively related to depressive symptoms, substance use, and delinquency in adolescence. Moreover, the study examines whether school engagement, which promotes health and well-being, has the capacity to offset the ill effect of exposure to maternal depressive symptoms for each outcome (i.e., serve as a protective factor). Specifically, it is

¹Unfortunately, limited sample sizes across race/ethnicity preclude the ability to examine if race/ethnicity moderates the proposed relationships.

hypothesized that school engagement weakens the ill effect of maternal depressive symptoms on depressive symptoms, substance use, and delinquency in adolescence. Finally, a key element of this study is the consideration of sex differences in risk, protective and promotive factors. Therefore, it is of interest whether the effects of maternal depressive symptoms and school engagement on the adolescent outcomes vary as function of sex, as well as whether the potential protective effect of school engagement varies as a function of sex. As such, the previously stated hypotheses are examined separately for mother-son and mother-daughter dyads.

Method

Data

This study employed data from the Rochester Intergenerational Study (RIGS), an intergenerational extension of the Rochester Youth Development Study (RYDS). RYDS consists of a birth cohort of 1,000 adolescents (referred to as Generation 2/G2; their primary caregiver is referred to as G1) from Rochester, New York in 1988, who were representative of the 7th and 8th grade public school population. In line with the goals of RYDS (see Thornberry et al., 2018), youth at high risk for antisocial behavior were overrepresented by oversampling males and students from neighborhoods with higher resident arrest rates (based on police record data from census tracts for 1987). The full socioeconomic spectrum for an urban population was represented (Farnworth, Thornberry, Krohn & Lizotte, 1994), but there was an overrepresentation of households that reported welfare receipt (~40%). G2s (the focal adolescents) completed three phases of interviews between 1988 and 2006. Phase I consisted of nine semi-annual interviews spanning 1988–1992, Phase II consisted of three annual interviews spanning 1994–1997, and Phase III consisted of two bi-annual interviews spanning 2003–2006.

RIGS began in 1999 with the identification of the first-born biological child of RYDS respondents (referred to as G3). Additional first-born children were added each subsequent year when the child turned two years of age. The RYDS parent and other primary caregiver complete(d) interviews annually until the RIGS child turns(ed) 18. Children complete(d) annual interviews beginning at age eight. Data from 539 parent-child dyads are available. All data collection procedures were approved by the Institutional Review Board at the University at Albany.

Sample

For the present analysis, data were used from 427 biological mother-child dyads for which there is at least three years of information on depressive symptoms for the biological mother spanning child ages eight to 13 and self-report data from G3 for at least one year during adolescence (ages 14–17).² Some 49% were mother-son dyads. Additionally, 38% of mother-child dyads included a biological mother who was a G2 participant in RYDS (the

²Only 476 mother-child dyads met the criteria for having a G3 complete at least one interview between the ages of 14 and 17 (63 were not yet 14 years of age at the last data collection). Nine mother-child dyads were removed from the sample because there was no information on maternal depressive symptoms between the ages of 8 and 13 and an additional 27 mother-child dyads were removed because there was not at least three years of information on maternal depressive symptoms. The remaining thirteen mother-child dyads were removed as a result of listwise deletion.

remaining were enrolled in RIGS as other primary caregivers - biological mothers of G3 children born to G2 fathers). Some 96% of G3s resided with their biological mother through at least age 17. Among years when G3 did not reside with one's biological mother, the mother had supervisory contact with the child. Analyses comparing the retained mother-child dyads ($n=427$) to all mother-child dyads in RIGS across various demographics (i.e., maternal participation in RYDS, community arrest rate, child living with mother, race/ethnicity of the child, child sex, and child birth year) reveal only one significant difference – children not retained in the final analytic sample were born later than those included in the final sample.

Measures

Maternal depressive symptoms.—Mothers self-reported their depressive symptoms at each RIGS interview using 19 items from the Center for Epidemiological Studies Depression (CES-D) scale (Radloff, 1977).³ This scale contains items (scored 0 [never] to 4 [always]) designed to capture the frequency and severity of common depressive symptoms in the past two weeks, with greater scores indicative of greater depressed mood. The reliability of the scale is robust at each child age from eight to 13 ($\alpha=.91-.94$). The measure of maternal depressive symptoms is the average of depressive symptoms spanning child age eight to 13, representing overall exposure to maternal depressive symptoms in late childhood and early adolescence and not necessarily the severity of symptoms at any point from late childhood to early adolescence.⁴ A full list of all the items in this scale (and other scales) is available in the Appendix.

Adolescent depressive symptoms.—G3 depressive symptoms were assessed each year between the ages of 14 and 17 using 13 items derived from the CES-D (Radloff, 1977). These items addressed common depressive symptoms, including changes in appetite and sleep, sad mood, and lack of concentration. G3 reported, since the date of the last interview, the frequency of each symptom (scored 0 [never] to 3 [often]).⁵ Inter-item reliability was high ($\alpha=.88-.90$) and the measure of adolescent depressive symptoms is the mean of the 13 items.

Adolescent substance use.—G3 self-reported their substance use each year between the ages of 14 and 17. After indicating whether or not the youth had used alcohol and marijuana, respectively, since the last interview, G3 was then asked how many times in the past year each substance was used. If monthly use was indicated for alcohol use or marijuana use, then G3 was asked seven questions related to problems associated with

³One item from the original scale ("I felt that I could not shake off the blues even with help from my family and friends") was not administered in this sample due to confusion reported by subjects in a pretest.

⁴Individual growth curves of maternal depressive symptoms were created and the intercept and slope of the growth curves (a linear slope best represented maternal growth curves) were used as predictors of each adolescent behavior. Given that only the intercept (i.e., level) was a significant predictor of adolescent behavior and not the slope (i.e., growth) of maternal depressive symptoms, we opted to present the results for the average of maternal depressive symptoms in late childhood for ease in interpretation. The effects of the intercept of maternal depressive symptoms and the average level of maternal depressive symptoms are the same in direction and significance.

⁵Due to differences in the CES-D (Radloff, 1977), the CES-D Adolescent (Radloff, 1977), and the principal investigators preferences, the reference period and response options for depressive symptoms vary between maternal measures of depressive symptoms and child measures of depressive symptoms.

alcohol use and/or marijuana use, respectively, including difficulties with school or work, the need to use more of a substance to get high, etc. The responses to these questions were used to create an ordinal measure of substance use in which 0=no substance use, 1=infrequent substance use (both alcohol and marijuana use was less than once per month), 2=regular substance use (monthly alcohol or marijuana use) but no reported problems, and 3=problem substance use (monthly alcohol or marijuana use that resulted in alcohol- or marijuana-induced problems).

Adolescent delinquency.—In each yearly interview between the ages of 14 and 17, G3 self-reported involvement in 31 delinquent behaviors, ranging in seriousness from property damage to robbery. If G3 indicated involvement in the behavior since the date of the last interview, he/she then reported how many different times he/she engaged in the behavior. Adolescent delinquency is the incidence of the 31 various offenses. Given the presence of extremely high outliers, delinquency incidence was top-coded at the 95th percentile in order to limit the influence of outliers.

School engagement.—In each yearly interview between the ages of 14 and 17, G3 endorsed his/her level of agreement (strongly disagree to strongly agree) to nine items that represent attitudes toward grades (e.g., “getting good grades is important to you”), sense of belonging (“you don’t really belong at school”), and effort in school (“you try hard at school”). G3 also reported his/her grades (failing, below average, average or above average) in four subjects (e.g., “What are your grades in English or language arts?”) and the importance of educational attainment (not important at all, not very important, important, and very important) using three items (e.g., “how important is it to you to go to college?”). All items were coded so that higher scores represent greater school engagement and were standardized due to differences in the response scales. The reliability among the individual items was adequate ($\alpha=.84$). School engagement is the mean of the 16 standardized items.

Control variables.—The following time-varying covariates were included to reduce the likelihood of omitted variable bias in the analyses. Peer support is the mean of six items from each yearly interview between the ages of 14 and 17 indicating if the individual feels that he/she can rely on friends in time of need. Peer delinquency is the mean of 11 items from each yearly interview between the ages of 14 and 17 indicating how many of his/her friends engaged in 11 delinquent behaviors, including substance use, theft, and robbery. Financial strain was self-reported by mothers in each yearly interview between child ages 14 and 17. It is a count of the number of affirmative responses to four items representing household financial hardship. Living with both parents is a binary variable where 1 represents that the child lived with both biological parents and 0 represents that the child did not live with both biological parents in each year between child age 14 and 17. It was constructed from maternal reports of individuals who live in the household. A continuous measure of child age is also included as a time-varying covariate in order to account for age trends in behavior.

The following time-stable control variables that are causally prior to maternal depressive symptoms, adolescent school engagement, and adolescent health risk problems are also included: child sex (male; female is the reference group), child race/ethnicity (Black;

Hispanic; White/Other serves as the reference group), maternal age at birth of child,⁶ maternal participation in RYDS (1=G2 was mother and 0=G2 was father), and community arrest rate of the G2 parent at the start of RYDS (a sampling parameter used to draw the initial RYDS panel). Descriptive statistics for all covariates included in this analysis are provided in Table 2.

Analytic Plan

This analysis is longitudinal in nature, with a continuous or discrete time-varying dependent variable (ages 14–17) and both time-varying (e.g., school engagement for ages 14 to 17) and time-stable predictors (e.g., maternal depressive symptoms in late childhood and early adolescence). As such, multilevel analyses (mixed effects models), which account for repeated observations nested within individuals, were performed in Stata 15 (StataCorp, 2015). To study the effects of the time-varying and time-stable covariates on adolescent depressive symptoms, mixed effects ordinary least squares models were employed. Mixed effects ordinal logistic regression models were used to assess the effects of the time-varying and time-stable covariates on adolescent substance use. Finally, since delinquency is a count and there is evidence of overdispersion, mixed effects negative binomial regression models were used for this outcome (Gardner, Mulvey, & Shaw, 1995).

The analytic strategy proceeded in stages. First, adolescent development of each health-risk problem (depressive symptoms, substance use, and delinquency) was modeled from age 14 to 17 in order to ascertain whether growth in the problem outcome was null (unconditional intercept-only model), linear, or quadratic in nature. Second, the time-stable covariate of maternal depressive symptoms was included in the multilevel model in order to assess its initial relationship with each outcome of interest. An interaction between maternal depressive symptoms and growth in the health risk problem, if any, was then included in order to determine if the effect of maternal depressive symptoms on the outcome was consistent across age (ages 14 to 17).⁷ In each of the two prior steps, significant coefficients and a likelihood ratio test of nested models were used to identify the best fitting model.

After the appropriate specification for the development of each outcome and its relationship with maternal depressive symptoms over time was identified, all time-varying and time-stable covariates were added to the model. All covariates were grand-mean centered with the exception of age, which was anchored at 14 (for ease in interpretation). Finally, a cross-level interaction between maternal depressive symptoms (between-individual) and school engagement (within-individual) was included in each model, in order to examine whether or not school engagement buffers the ill effects of maternal depressive symptoms on each outcome. All models were estimated separately for mother-son and mother-daughter dyads, and comparisons regarding the relative importance of coefficients across mother-child sex were made, if relevant, using the formula suggested by Paternoster and colleagues (1997; Brame et al., 1998).

⁶Given that maternal age at birth of G3 was highly correlated with G3's year of birth, both covariates were not included in the models simultaneously. Nonetheless, all models were estimated with each covariate, respectively - maternal age at G3 birth and G3 birth year - and the results were the same in direction and significance.

⁷For simplicity, we did not allow slopes to vary across individuals.

Results

Before presenting the results for the growth models, Table 1 presents descriptive information for each adolescent health-risk problem across child age to demonstrate raw patterns of growth across child sex. For both sons and daughters, depressive symptoms appear to increase with age before decreasing again at age 17. On the other hand, substance use and delinquency appear to linearly increase with child age for both sons and daughters. Table 1 also demonstrates that across each age (14 to 17) daughters self-report, on average, more frequent depressive symptoms than sons ($p < .01$).⁸ With respect to substance use, the mean level of substance use is significantly higher for daughters compared to sons at age 15 only. No other significant differences in substance use appear across child age. Similarly, there are no significant differences in delinquency across child sex for each child age 14 to 17.

Table 2 presents the descriptive information for each time-varying and time-stable covariate included in this analysis separately for mother-son and mother-daughter dyads. Notably, school engagement is significantly higher among daughters than sons, which is in line with extant research (Lam et al., 2012).

Depressive Symptoms

The unconditional intercept-only model, which represents no change in child depressive symptoms over time, provided the best model fit for mother-son dyads (linear coefficient for age was not significant, $b = -.01$, $se = 0.01$; linear and quadratic coefficients for growth were not significant, $b = 0.01$, $se = 0.05$; $b = -0.01$, $se = 0.01$, respectively). Linear growth best represented the change in offspring depressive symptoms among mother-daughter dyads (the linear growth coefficient, $b = 0.03$, $se = 0.01$; the linear and quadratic growth coefficients were not significant, $b = -0.05$, $se = 0.05$; $b = -0.01$, $se = 0.02$). After establishing that maternal depressive symptoms in late childhood and early adolescence exert a positive, significant effect on sons' depressive symptoms ($b = 0.23$, $se = 0.07$, $p < .01$) and daughters' depressive symptoms ($b = 0.46$, $se = 0.08$, $p < .01$), subsequent analyses demonstrated that the effect of maternal depressive symptoms on offspring depressive symptoms did not vary across adolescent age (the interaction between maternal depressive symptoms and child age was not significant for sons, $b = -0.04$, $se = 0.03$ or daughters, $b = -0.04$, $se = 0.03$). Although an intercept-only model best represented change in sons' depressive symptoms, age was retained as a covariate in all subsequent models given its relationship with other covariates in order to limit omitted variable bias (see Appendix).

Table 3 presents the relationship between maternal depressive symptoms in late childhood and early adolescence and offspring depressive symptoms accounting for school engagement and the remaining time-varying and time-stable controls. Notably, Model 1 demonstrates that maternal depressive symptoms exert a positive, significant effect on sons' depressive symptoms. As expected, school engagement was negatively related to sons' depressive

⁸Tests for significant difference in means were calculated using the following formula: $t = \frac{x_1 - x_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$

symptoms. With respect to daughters, Model 3 demonstrates that maternal depressive symptoms similarly exerts a positive, significant effect on offspring depressive symptoms. Additional analyses reveal that the ill effect of maternal depressive symptoms is significantly stronger among daughters compared to sons ($p<.01$). School engagement is also negatively related to depressive symptoms among daughters, and again this effect is stronger among daughters compared to sons ($p<.01$).

Model 2 and Model 4 in Table 3 examine whether school engagement buffers against the ill effects of maternal depressive symptoms on offspring depressive symptoms. Among both mother-son and mother-daughter dyads, the interaction term is not significant indicating that there is no evidence of a buffering protective effect of school engagement.

Substance Use

Among sons, linear growth best represents the change in substance use across age ($b=1.02$, $se=0.14$). Among daughters, both the linear ($b=1.49$, $se=0.41$, $p<.01$) and quadratic growth ($b=-0.25$, $se=0.12$, $p<.05$) terms were significant, indicating decelerating growth in substance use for daughters across adolescence. After confirming that maternal depressive symptoms were related to offspring substance use in both sons ($b=1.32$, $se=0.50$, $p<.01$) and daughters ($b=1.02$, $se=0.50$, $p<.05$), there was no evidence that the effect of maternal depressive symptoms in late childhood and early adolescence varies in effect across adolescence as the interaction between maternal depressive symptoms and age was not significant among sons ($b=-0.02$, $se=0.25$). Likewise, the interaction between maternal depressive symptoms and the linear ($b=0.49$, $se=0.78$) or quadratic ($b=-0.21$, $se=0.24$) age terms were not significant among daughters, suggesting the effect of maternal depressive symptoms in late childhood and early adolescence on adolescent substance use is consistent across age.

Next, the effect of maternal depressive symptoms and school engagement on adolescent substance use among sons and daughters was investigated net of time-varying and time-stable controls (see Table 4). Model 1 indicates that maternal depressive symptoms in late childhood and early adolescence are positively related to sons' substance in adolescence. In fact, the odds of problem substance use versus the combined other levels of substance use are nearly 4 times higher ($OR=3.93$) for a one unit increase in maternal depressive symptoms (e.g., average change from never to seldom or average change from sometimes to often). On the other hand, Model 3 demonstrates that maternal depressive symptoms are not related to daughters' substance use in adolescence net of controls, including delinquent peers ($b=3.51$, $se=0.42$, $p<.01$). Another noteworthy difference emerged across child sex. For daughters, school engagement is negatively related to substance use ($b=-1.42$, $se=0.30$, $p<.01$) but this relationship is significantly smaller ($p<.01$) and only marginally significant among sons ($b=-0.62$, $se=0.35$, $p<.10$). Lastly, the interaction between maternal depressive symptoms and school engagement is not significant, indicating that school engagement does not serve as a protective factor buffering the ill effects of maternal depressive symptoms for either sons or daughters.

Delinquency

Among sons, linear growth best represents the change in delinquency across adolescence ($b=0.35$, $se=0.06$, $p<0.01$). Among daughters, decelerating growth best represents the change in delinquency across age as both the linear and quadratic age terms are significant ($b=0.83$, $se=0.24$, $p<0.01$; $b=-0.15$, $se=0.07$, $p<0.05$). Notably, maternal depressive symptoms in late childhood and early adolescence are positively related to delinquent behavior in adolescence for daughters ($b=1.09$, $se=0.38$, $p<0.01$), but not for sons ($b=0.42$, $se=0.35$). However, the effect of maternal depressive symptoms for sons in late childhood and early adolescence appears to vary across age as the interaction between maternal depressive symptoms and age is positive and marginally significant ($b=0.25$, $se=0.14$, $p<0.10$). In other words, the ill effect of maternal depressive symptoms in late childhood and early adolescence on delinquent behavior increases with age for males. Figure 1 illustrates this relationship, demonstrating the predicted number of delinquency incidents at one standard deviation above and below the mean of maternal depressive symptoms across adolescent age. In contrast, the effect of maternal depressive symptoms in late childhood and early adolescence on delinquent activity does not vary across adolescence among daughters as the interactions between maternal depressive symptoms and the linear and quadratic age terms are not significant ($b=-0.30$, $se=0.45$; $b=0.19$, $se=0.15$, respectively).

Table 5 presents the relationship between each time-varying and time-stable covariate and delinquency for both sons and daughters. Again, Model 1 demonstrates that the ill effect of maternal depressive symptoms on sons' delinquency increases with age. Moreover, school engagement is negatively related to delinquency among sons. Among daughters, Model 3 indicates that maternal depressive symptoms in late childhood and early adolescence are positively associated with delinquency. Similar to sons, school engagement is negatively associated with girls' delinquency. However, the inhibiting effect of school engagement is stronger for daughters compared to sons ($t=34.80$, $p<0.01$).

The results presented in Model 2 in Table 5 do not suggest that school engagement buffers the ill effects of maternal depressive symptoms on delinquency among sons. Alternatively, and contrary to expectations, Model 4 in Table 5 indicates that the effect of maternal depressive symptoms on daughters' delinquency is amplified with higher levels of school engagement. Another way to interpret the positive, significant interaction between maternal depressive symptoms and school engagement is that the promotive effect of school engagement on delinquency is weakened if the daughter is exposed to more frequent maternal depressive symptoms in late childhood and early adolescence (see Figure 2).

Sensitivity Analyses

As a supplemental analysis, we investigated whether school commitment (items 1–9 in the school engagement scale; see Appendix) provided different results. The effects of school commitment were the same in direction and significance as those presented, which include the more encompassing construct of school engagement. Additionally, we explored whether other sources of social support external to the family environment – peer support and prosocial activity involvement – buffered the ill effects of maternal depressive symptoms on adolescent health risk problems. These analyses similarly did not demonstrate that either

potential source of social support external to the family served as a protective factor for maternal depressive symptoms.

Discussion

Adolescent depressive symptoms, substance use, and delinquency continue to pose serious public health concerns despite ongoing efforts to prevent and intervene (Avenevoli et al., 2015; Welsh et al., 2008). In order to improve prevention and intervention efforts, it is of utmost importance to thoroughly investigate the etiology of such problems in order to identify specific targets for intervention. The present results confirm the established relationship between maternal depressive symptoms and three salient offspring health problems: depressive symptoms, substance use, and delinquency, and they also suggest several nuances not identified in prior research. For instance, school engagement varied in its role as a promotive factor across child sex and health risk problem, with effects being generally stronger for daughters compared to sons and variable in magnitude depending on the specific observed outcome (i.e., depressive symptoms versus substance use versus delinquency). Contrary to our hypotheses, school engagement was insufficient to offset the risk imparted by having a mother who experienced more frequent and severe depressive symptoms during offspring's late childhood and early adolescence, which carries important implications for intervention and prevention planning. Finally, the inclusion of peer support as a control variable illustrated that the contemporaneous, time-varying indicator of peer delinquency was significantly related to each health risk problem among sons and daughters, underscoring the importance of peer relationships on a variety of adolescent health risk problems. These findings in regard to how they may inform the current understanding of youth development in social contexts and the resulting practical implications are further discussed below.

When considering the total effect of mothers' depressive symptoms on offspring's health risk problems, the present results were consistent with much of the extant literature in this area. Greater maternal depressive symptoms during late childhood and early adolescence were related to greater child reports of depressive symptoms, substance use, and delinquency during adolescence. Notably, though, maternal depressive symptoms in late childhood and early adolescence were unrelated to delinquency among sons in early adolescence but became a significant risk factor for delinquency in later adolescence. The present results also confirmed prior research demonstrating that maternal depressive symptoms had a stronger effect on daughters' risk of depressive symptoms than sons. Additionally, with the exception of the effect of maternal depressive symptoms on daughters' substance use, the direct effect of maternal depressive symptoms on each adolescent health risk problem remained even when accounting for the time-varying factors of school engagement, delinquent peers, and family economic status.

It is interesting to note that school engagement provided varying promotive effects for each health risk problem, and, at times, varied in magnitude or significance across child biological sex. For instance, although school engagement was associated with reduced depressive symptoms, substance use, and delinquency for both sons and daughters, the magnitude of its promotive effects varied across child sex. For example, the promotive effect

of school engagement on all health risk problems was stronger for daughters compared to sons. Contrary to hypotheses, school engagement did not serve in a buffering protective capacity for adolescents whose mothers experienced greater depressive symptoms during their offspring's late childhood and early adolescence. In fact, daughters' better school engagement amplified the harmful effect of maternal depressive symptoms on daughters' delinquency, which was contrary to hypotheses. One takeaway from the present results is that child sex carries implications for whether and how maternal depressive symptoms impact adolescent development of health risk problems, as well as how school engagement acts as a promotive factor. This is consistent with Bussey and Bandura's (1999) social cognitive theory of gender development, which suggests that boys and girls receive differential messages and modeling from others, which in turn shapes the thoughts and behaviors in which boys and girls engage and how they respond to risk and promotive factors in their immediate environment. The identification of varying relevance and magnitude of risk and promotive factors is not unique to this research; nonetheless, it underscores the importance of continuing to acknowledge and identify sex differences in the etiological pathways of healthy development for prevention and intervention purposes.

Additionally, while we found a beneficial effect of school engagement on all three outcomes, we found no evidence that school engagement buffered the harmful effect of maternal depressive symptoms on the targeted adolescent health risk problems, which is surprising in light of other research which has demonstrated the positive, robust effects school engagement has on these outcomes (e.g., Fontaine, Brendgen, Vitaro & Tremblay, 2016; Bond et al., 2007). A priori beliefs led to the formation of hypotheses guiding this research, but the finding that school engagement, by and large, does not serve as a buffering protective factor may be accounted for by various explanations. One alternative explanation may be that school engagement needs to be contemporaneous with the risk factor in order to buffer ill effects of prior risk factors. Or, it may rely on the interaction with positive peer influence in order to offset the negative impacts imparted within the family domain. Nonetheless, the present findings underscore the potency and scope of the negative influence of exposure to maternal depressive symptoms on adolescent health risk problems and are suggestive that risks conveyed early in life can have pervasive, negative consequences throughout adolescence.

These findings offer insights that may prove informative with respect to guiding public-health goals aimed at reducing adolescent health risk problems. A primary implication stemming from these results is that intervention efforts specifically targeting maternal depressive symptoms likely hold more merit than interventions that focus on improving school engagement among adolescents that have been exposed to maternal depression (see also: Brennan, Le Brocque & Hammen, 2003). Home visiting programs such as in-home cognitive-behavioral therapy (IH-CBT) show promise in successfully mitigating some of the ill effects associated with maternal depression (Ammerman et al., 2013), as do interventions that integrate parent-training (e.g., Enhanced Triple P-Positive Parenting Program; Sanders, Markie-Dadds & Turner, 2003) with partner support components to bolster parenting skills. These types of interventions aid in decreasing maternal distress, improving daily functioning, and increasing nurturing and stimulating parenting behavior (Goodman & Garber, 2017). In addition, the finding that school engagement fails to protect youth from the

ill-effects of maternal depressive symptoms may illuminate why some adolescents respond well to programs that enhance commitment and attachment to school while others succumb to maladaptive and unhealthy behaviors. The added value of screening for maternal psychopathology is clear: ensuring that depressed mothers get the help they need is of critical importance not only for their own health but also for the healthy development of their children.

While the present study's findings are informative with respect to the study of the etiology of adolescent health risk problems, it is not without its limitations. First, the sample used here represents families where a biological parent lived in one urban jurisdiction in New York during adolescence; thus, the generalizability of these findings may be somewhat limited. Still, the benefit of an ethnically/racially diverse, urban sample may offset this limitation. It is important to acknowledge that genetic factors are a known contributing factor to adolescent health risk problems, but, unfortunately, the authors were precluded from accounting for these influences due to the scope of data collected from respondents. As such, the present results should therefore be interpreted with the knowledge that biology and environment interact to produce observed outcomes and familial patterns. Further, this research relied on self-reported behaviors of mothers and their children, which are subject to some bias, but the reliance upon official data that include clinical diagnoses of depressive disorders, substance use disorders, and arrest records would certainly limit the scope of how youth may be negatively affected by maternal depressive symptomatology. Finally, due to sample size limitations it was not possible to further examine potential subgroup differences in this dataset (e.g., race/ethnicity). Future research should ascertain differences and similarities in the examined relationships across key demographic variables in order to better identify meaningful areas of intervention and prevention within mother-child dyads that may be more culturally or demographically appropriate.

Conclusion

Maternal depressive symptoms in late childhood and early adolescence impart a heightened risk for a variety of health risk problems among offspring that appears robust even in the presence of the child's school engagement, a key promotive factor during this developmental period. The importance of understanding and intervening in these developmental pathways should not be underestimated. Mitigating the cascading effect of maternal depression is clearly a difficult yet worthwhile goal that, if achieved, could improve the health of future generations. This study provides additional nuanced information regarding the time-varying effects of maternal depressive symptoms on offspring outcomes in adolescence. Furthermore, the findings suggest that investments in school among males and females, while noteworthy in its own right given its varying promotive effects on adolescent health risk problems, likely does not have the ability to offset the risk imparted by a mother who displayed elevated levels of depressive symptomatology in late childhood and early adolescence. As such, subsequent research should continue to explore maternal treatment as well as individual child and familial factors that can potentially buffer the ill effects of maternal depressive symptoms experienced in late childhood and early adolescence in order to promote healthy development and individual success among future generations.

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Data Sharing Declaration

The data for this study are not currently available to the public, but provisions to deposit the Rochester Intergenerational Study data at the Inter-University Consortium for Political and Social Research are currently underway.

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Appendix A.: Individual Items in Scales

Maternal Depressive Symptoms ($\alpha=0.91-.94$)

In the past two weeks, how often did you?

Responses: 0 (Never), 1 (Seldom), 2 (Sometimes), 3 (Often), 4 (Always)

- 1 Feel bothered by things that don't usually bother you?
- 2 Not feel like eating or have a poor appetite?
- 3 Feel you had trouble keeping your mind on what you were doing?
- 4 Feel depressed?
- 5 Feel that everything you did was an effort, or that everything was difficult for you to do?
- 6 Feel hopeful for the future? (reverse coded)
- 7 Feel that you were just as good as other people? (reverse coded)
- 8 Think your life has been a failure?
- 9 Feel fearful?
- 10 Sleep restlessly?
- 11 Feel happy? (reverse coded)
- 12 Feel that you talked less than usual?
- 13 Feel lonely?
- 14 Feel that people were unfriendly?
- 15 Feel you enjoyed life? (reverse coded)
- 16 Have crying spells?
- 17 Feel sad?
- 18 Feel people disliked you?
- 19 Feel that you could not "get going"?

Adolescent Delinquency

Since the date of the last interview, have you? No/Yes.

If yes, how many times?

- 1 Run away from home in the past year?
- 2 Skipped classes without an excuse in the past year?
- 3 Lied about your age to get into some place or to buy something?

- 4 Hitchhiked a ride with a stranger?
- 5 Carried a hidden weapon?
- 6 Been loud or rowdy in a public place where somebody complained and you got in trouble?
- 7 Begged for money or things from strangers?
- 8 Been drunk in a public place?
- 9 Damage, destroyed or marked up somebody else's property on purpose?
- 10 Set fire on purpose or tried to set fire to a house, building or car?
- 11 Avoided paying for things, like a movie, taking bus rides, using a computer or anything else?
- 12 Gone into or tried to go into a building to steal or damage something?
- 13 Tried to steal or actually stolen money or things worth \$5 or less?
- 14 Tried to steal or actually stolen money or things worth between \$5 and \$50?
- 15 Tried to steal or actually stolen money or things between \$50 and \$100?
- 16 Tried to steal or actually stolen money or things over \$100?
- 17 Tried to buy or sell things that were stolen?
- 18 Take a car or motorcycle for a ride without the owner's permission?
- 19 Stolen or tried to steal a car or motor vehicle?
- 20 Forged a check or used fake money to pay for something?
- 21 Used or tried to use a credit card, bank card, or automatic teller card without permission?
- 22 Attacked someone with a weapon or with the idea of seriously hurting or killing them?
- 23 Hit someone with the idea of hurting them, other than what you already mentioned?
- 24 Been involved in a gang or posse fight?
- 25 Thrown objects such as rocks or bottles at people, other than what you already mentioned?
- 26 Used a weapon or force to make someone give you money?
- 27 Made obscene phone calls?
- 28 Been paid for having sexual relations with someone?
- 29 Physically hurt or threatened to hurt someone to get them to have sex with you?
- 30 Sold marijuana, weed or reefer?
- 31 Sold hard drugs such as crack, heroin, cocaine, LSD or acid?

Adolescent Depressive Symptoms ($\alpha=0.88-.90$)

Since your last interview, how often did you? 0) Never, 1) Almost never, 2) Sometimes, 3) Often

- 1 Feel you had trouble keeping your mind on what you were doing?
- 2 Feel depressed or very sad?
- 3 Feel hopeful about the future? (reverse-coded)
- 4 Feel bothered by things that don't usually bother you?
- 5 Not feel like eating because you felt upset about something?
- 6 Feel that everything you did was an effort, or that everything was difficult for you to do?
- 7 Feel scared or afraid?
- 8 Toss and turn because you couldn't sleep?
- 9 Feel that you talked less than usual?
- 10 Feel nervous or stressed?
- 11 Feel lonely?
- 12 Feel people disliked you?
- 13 Feel you enjoyed life? (reverse-coded)

School Engagement ($\alpha=0.84$)
How much do you agree or disagree with these statements? 1) Strongly disagree, 2) Disagree, 3) Agree, 4) Strongly Agree

- 1 You like school a lot
- 2 School is boring to you (reverse-coded)
- 3 You do poorly at school (reverse-coded)
- 4 You don't really belong at school (reverse-coded)
- 5 Homework is a waste of time (reverse-coded)
- 6 You try hard at school
- 7 You usually finish your homework
- 8 Getting good grades is important to you
- 9 Sometimes you do extra work to improve your grades

How important is it to you? 1) Not important at all, 2) Not very important, 3) Important, 4) Very important

- 1 To graduate from high school?
- 2 To go to college?
- 3 To graduate from college?

What are your grades in? 0) Failing, 1) Below average, 2) Average, 3) Above average

- 1 English or language arts?
- 2 History or social studies?
- 3 Arithmetic or math?
- 4 Science?

Peer Support ($\alpha=0.90$)

If you needed to, how likely would you be to? 1) Very unlikely, 2) Unlikely, 3) Likely, 4) Very likely

- 1 Talk to friends about personal or private things?
- 2 Ask friends for advice when you need to make an important decision?
- 3 Borrow money from a friend?
- 4 Talk to friends about problems you are having with family members?
- 5 Talk to friends about trouble you are having at school?
- 6 Go to friends for help in an emergency?
- 7 How likely friends are to care about you no matter what is happening in your life?

Peer Delinquency

Since your last interview, how many of these friends? 1) None of them, 2) A few of them (1 or 2), 3) Some of them, 4) Most of them

- 1 Used money or force to get money or things from people?
- 2 Attacked someone with a weapon or with the idea of seriously hurting them?
- 3 Hit someone with the idea of hurting them?
- 4 Stole something worth more than \$100?
- 5 Stole something worth more than \$5 but less than \$50?
- 6 Damaged or destroyed someone else's property?
- 7 Took a car or motorcycle for a ride or drive without the owner's permission?
- 8 Used marijuana, weed or reefer?
- 9 Used ecstasy, "X", "E", or other club drugs?
- 10 Used hard drugs such as crack, heroin, cocaine, LSD or acid?

11 Drank beer, wine or liquor?

Appendix B.: Correlation Matrix for Mother-Son Dyads (N*T=745, N=212)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1.00													
2	0.10**	1.00												
3	0.12**	0.39**	1.00											
4	0.15**	0.15**	0.07*	1.00										
5	-0.25**	-0.22**	-0.19**	-0.09*	1.00									
6	0.00	0.12**	0.02	0.01	0.18**	1.00								
7	0.22**	0.49**	0.37**	0.08	-0.31**	0.04	1.00							
8	0.05	-0.06	-0.03	-0.09	-0.01	0.08*	-0.03	1.00						
9	0.05	0.01	-0.02	-0.26**	-0.07	0.06	0.04	-0.09*	1.00					
10	0.02	0.28**	0.14	-0.03	-0.10**	0.28**	0.16**	-0.04	-0.00	1.00				
11	-0.06	-0.05	-0.06	-0.11**	0.07*	0.04	-0.01	-0.20**	0.03	0.01	1.00			
12	0.08*	0.03	0.08*	0.11**	-0.00	-0.01	0.04	0.01	0.02	-0.01	-0.64**	1.00		
13	-0.08*	-0.04	-0.07*	-0.09*	0.12**	0.09*	-0.06	0.18**	-0.04	-0.06	-0.17**	-0.04	1.00	
14	-0.05	-0.10*	-0.02	-0.01	0.10**	-0.01	-0.06	-0.00	0.01	-0.01	0.10	0.06	-0.18**	1.00

* p < .05,

** p < .01

1. Adolescent Depressive Symptoms (Avg. 14–17)
2. Adolescent Substance Use (Avg. 14–17)
3. Adolescent Delinquency (Avg.14–17)
4. Maternal Depressive Symptoms (Avg. 8–13)
5. School Engagement (Avg.14–17)
6. Peer Support (Avg.14–17)
7. Peer Delinquency (Avg.14–17)
8. Live with Both Parents (Avg.14–17)
9. Financial Strain (Avg.14–17)
10. Age
11. Black
12. Hispanic
13. G3 Birth Year
14. Neighborhood Arrest Rate

Appendix C.: Correlation Matrix For Mother-Daughter Dyads (N*T=759, N=215)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1.00													

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
2	0.26**	1.00												
3	0.16**	0.44**	1.00											
4	0.30**	0.11**	0.08*	1.00										
5	-0.32**	-0.33**	-0.30**	-0.11**	1.00									
6	-0.06	0.07*	-0.01	0.00	0.18**	1.00								
7	0.28**	0.56**	0.40**	0.07*	-0.28**	0.06	1.00							
8	-0.06	0.00	-0.01	-0.06	0.03	-0.03	-0.04	1.00						
9	0.19**	0.12**	0.04	0.29**	-0.16**	-0.05	0.06	-0.03	1.00					
10	0.02	0.23**	0.08*	0.02	0.01	0.26**	0.10**	-0.03	0.09*	1.00				
11	-0.07*	-0.14**	-0.03	-0.12**	0.16**	0.01	-0.02	-0.11**	-0.13**	0.01	1.00			
12	0.03	-0.01	-0.06	0.19**	-0.08*	-0.01	-0.02	-0.03	0.08*	-0.01	-0.63**	1.00		
13	-0.10**	-0.01	-0.03	-0.05	0.07*	-0.01	0.01	0.20**	0.00	-0.09*	-0.21**	0.06	1.00	
14	-0.08*	-0.05	0.03	0.00	0.06	-0.11**	-0.07*	-0.04	-0.03	0.03	0.19**	0.01	-0.09*	1.00

* $p < .05$,
 ** $p < .01$

1. Adolescent Depressive Symptoms (Avg. 14–17)
2. Adolescent Substance Use (Avg. 14–17)
3. Adolescent Delinquency (Avg. 14–17)
4. Maternal Depressive Symptoms (Avg. 8–13)
5. School Engagement (Avg. 14–17)
6. Peer Support (Avg. 14–17)
7. Peer Delinquency (Avg. 14–17)
8. Live with Both Parents (Avg. 14–17)
9. Financial Strain (Avg. 14–17)
10. Age
11. Black
12. Hispanic
13. G3 Birth Year
14. Neighborhood Arrest Rate

Biography

Celia J. Fulco is a PhD candidate in Counseling Psychology at Colorado State University. Her research focuses on the intergenerational transmission of psychopathology and problem behaviors, with an emphasis on parenting factors, youth resiliency, and interpersonal relationships.

Megan Bears Augustyn is an assistant professor of Criminal Justice at the University of Texas at San Antonio. Her research is focused on the causes and consequences of crime, victimization and other health-risk behaviors across the life course.

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Figure 1.
Predicted Number of Delinquency Incidents at 1 SD below the Mean of Maternal Depressive Symptoms and 1 SD above the Mean of Maternal Depressive Symptoms for Male Offspring

Figure 2.
Predicted Number of Delinquency Incidents at 1 SD below the Mean of Maternal Depressive Symptoms and 1 SD above the Mean of Maternal Depressive Symptoms across Levels of School Engagement for Female Offspring

Table 1.**Outcomes by Child Age**

	Range	Mother-son Dyads (N=212)			Mother-daughter Dyads (N=215)		
		N	Mean	SD	N	Mean	SD
Child Depressive Symptoms 14	0–3	199	0.88	0.67	193	1.20 ^{**}	0.68
Child Depressive Symptoms 15	0–3	177	0.88	0.56	186	1.24 ^{**}	0.75
Child Depressive Symptoms 16	0–2.91	176	0.90	0.58	167	1.30 ^{**}	0.67
Child Depressive Symptoms 17	0–2.81	150	0.84	0.61	147	1.24 ^{**}	0.70
Child Substance Use 14	0–3	199	0.11	0.40	193	0.15	0.49
Child Substance Use 15	0–3	177	0.16	0.51	186	0.32 [*]	0.78
Child Substance Use 16	0–3	176	0.38	0.81	167	0.41	0.78
Child Substance Use 17	0–3	150	0.47	0.90	147	0.45	0.83
Child Delinquency 14	0–101	199	6.31	20.16	193	4.52	15.52
Child Delinquency 15	0–101	177	7.88	21.87	186	9.31	23.86
Child Delinquency 16	0–101	176	12.34	26.32	167	8.68	22.14
Child Delinquency 17	0–101	150	15.28	30.69	147	10.46	26.30

*
p<.05,

**
p<.01 (two-tailed test for significant difference across child sex)

Table 2.

Descriptive Statistics for Covariates

	Range	Mother-son Dyads (N=212)			Mother-daughter Dyads (N=215)		
		N*T/N	Mean/Proportion	SD	N*T/N	Mean/Proportion	SD
Time-Varying Covariates		N*T			N*T		
School Engagement	−3.03–.96	745	−0.06	0.49	759	0.08	0.53
Peer Support	1–4	745	3.15	0.62	759	3.61	0.43
Peer Delinquency	1–4	745	1.29	0.39	759	1.29	0.37
Maternal Financial Strain	0–4	745	0.56	1.14	759	0.47	1.07
Both Parents	0,1	745	0.17	-	759	0.14	-
Age	14–17	745	15.43	1.14	759	15.43	1.11
Time-Stable Covariates		N					
Maternal Depressive Symptoms	1.03–3.29	212	1.81	0.49	215	1.84	0.50
Race/ethnicity							
Black	0,1	212	0.64		215	0.68	
Hispanic	0,1	212	0.19	-	215	0.15	-
White/other (reference)	0,1	212	0.17	-	215	0.17	-
Child Birth Year	1986–2002	212	1993.84	3.11	215	1994.43	3.40
Community Arrest Rate	0.12–7.87	212	4.58	2.00	215	4.33	1.95

Note. All covariates are grand-mean centered in the analyses with the exception of age, which is centered at 14.

Table 3.**Multilevel Linear Regression Models for Adolescent Depressive Symptoms**

	Mother-son Dyads (N*T=745, N=212)		Mother-daughter Dyads (N*T=759, N=215)	
	Model 1 Base Model	Model 2 Interaction Model	Model 3 Base Model	Model 4 Interaction Model
	b(SE)	b(SE)	b(SE)	b(SE)
Maternal Depressive Symptoms	0.19 ** (0.07)	0.18 * (0.07)	0.41 ** (0.08)	0.41 ** (0.08)
School Engagement	-0.14 ** (0.04)	-0.14 ** (0.04)	-0.22 ** (0.04)	-0.22 ** (0.04)
Maternal Depressive*School Engagement	-	-0.09 (0.08)	-	0.02 (0.09)
Peer Support	0.07 (0.04)	0.07 (0.04)	0.11 * (0.05)	0.11 * (0.05)
Delinquent Peers	0.17 ** (0.06)	0.18 ** (0.06)	0.23 ** (0.06)	0.23 ** (0.06)
Both Parents	0.11 (0.08)	0.11 (0.08)	-0.02 (0.08)	-0.01 (0.08)
Financial Strain	0.02 (0.02)	0.02 (0.02)	-0.00 (0.01)	-0.00 (0.02)
Age	-0.03 * (0.01)	-0.03 * (0.01)	0.01 (0.02)	0.01 (0.01)
Black	0.01 (0.10)	0.01 (0.10)	-0.10 (0.10)	-0.10 (0.10)
Hispanic	0.07 (0.11)	0.06 (0.11)	-0.21 (0.13)	-0.21 (0.13)
Birth Year	-0.01 (0.01)	-0.01 (0.01)	-0.02 (0.01)	-0.02 (0.01)
Community Arrest Rate	-0.00 (0.02)	-0.00 (0.02)	-0.03 (0.02)	-0.03 (0.02)

Note. School engagement, peer support, delinquency peers, both parents, financial strain and age are time-varying covariates (level 1). Maternal depressive symptoms, Black, Hispanic, birth year, and community arrest rate are time-stable covariates (level 2). All non-binary covariates are grand-mean centered with the exception of age, which is centered at 14

Abbreviations. b=coefficient, SE=standard error

⁺ p<.10,

* p<.05,

** p<.01 (two-tailed test)

Table 4.**Multilevel Ordinal Logistic Regression Models for Adolescent Substance Use**

	Mother-son Dyads (N*T=745, N=212)		Mother-daughter Dyads (N*T=759, N=215)	
	Model 1 Base Model	Model 2 Interaction Model	Model 3 Base Model	Model 4 Interaction Model
	b(SE)	b(SE)	b(SE)	b(SE)
Maternal Depressive Symptoms	1.37 ** (0.48)	1.44 ** (0.51)	0.55 (0.42)	0.63 (0.43)
School Engagement	-0.62 ⁺ (0.32)	-0.63 ⁺ (0.35)	-1.42 ** (0.30)	-1.46 ** (0.30)
Maternal Depressive*School Engagement	-	0.26 (0.64)	-	0.89 (0.58)
Peer Support	0.47 (0.31)	0.47 (0.31)	0.22 (0.41)	0.23 (0.41)
Delinquent Peers	3.63 ** (0.45)	3.61 ** (0.46)	3.51 ** (0.42)	3.53 ** (0.42)
Both Parents	-0.29 (0.62)	-0.29 (0.62)	0.32 (0.54)	0.34 (0.54)
Financial Strain	-0.19 (0.14)	-0.19 (0.14)	0.07 (0.12)	0.07 (0.12)
Age	0.76 ** (0.14)	0.75 ** (0.15)	1.42 ** (0.43)	1.46 ** (0.43)
Age ²	-	-	-0.26 * (0.13)	-0.27 * (0.13)
Black	-0.48 (0.65)	-0.47 (0.65)	-1.29 ** (0.56)	-1.31 * (0.56)
Hispanic	-0.14 (0.77)	-0.13 (0.77)	-1.39 ⁺ (0.70)	-1.46 * (0.73)
Birth Year	-0.16 * (0.08)	-0.16 * (0.08)	-0.13 ⁺ (0.06)	-0.12 ⁺ (0.06)
Community Arrest Rate	-0.29 * (0.12)	-0.29 * (0.12)	-0.16 (0.11)	-0.17 (0.11)

Notes. School engagement, peer support, delinquency peers, both parents, financial strain and age are time-varying covariates (level 1). Maternal depressive symptoms, Black, Hispanic, birth year, and community arrest rate are time-stable covariates (level 2). All non-binary covariates are grand-mean centered with the exception of age, which is centered at 14. Among mother-son dyads, linear growth best represented the change in substance use across age. Among mother-daughter dyads, quadratic growth best represented the change in substance use across age.

Abbreviations. b=coefficient, SE=standard error

⁺ p<.10,

* p<.05,

** p<.01 (two-tailed test)

Table 5.**Multilevel Negative Binomial Models for Adolescent Delinquency**

	Mother-son Dyads (N*T=745, N=212)		Mother-daughter Dyads (N*T=759, N=215)	
	Model 1 Base Model	Model 2 Interaction Model	Model 3 Base Model	Model 4 Interaction Model
	b(SE)	b(SE)	b(SE)	b(SE)
Maternal Depressive Symptoms	−0.43 (0.36)	−0.43 (0.36)	0.78 ** (0.30)	0.73 * (0.30)
School Engagement	−0.53 ** (0.20)	−0.54 ** (0.19)	−1.19 ** (0.19)	−1.23 ** (0.19)
Maternal Depressive*School Engagement	-	−0.28 (0.39)	-	0.98 ** (0.37)
Peer Support	0.11 (0.17)	0.10 (0.17)	−0.29 (0.22)	−0.28 (0.22)
Delinquent Peers	2.15 ** (0.24)	2.17 ** (0.25)	1.92 ** (0.28)	1.93 ** (0.28)
Both Parents	0.13 (0.35)	0.13 (0.35)	0.01 (0.36)	0.05 (0.36)
Financial Strain	−0.04 (0.07)	−0.03 (0.07)	0.03 (0.08)	0.02 (0.08)
Age	0.17 * (0.07)	0.17 * (0.07)	0.62 ** (0.22)	0.66 ** (0.22)
Age ²	-	-	−0.13 ⁺ (0.07)	−0.15 * (0.07)
Maternal Depressive Symptoms*Age	0.36 ** (0.13)	0.34 * (0.13)		
Black	0.25 (0.43)	0.23 (0.43)	−0.18 (0.41)	−0.20 (0.41)
Hispanic	0.58 (0.50)	0.57 (0.50)	−0.79 (0.52)	−0.82 (0.52)
Birth Year	−0.15 ** (0.05)	−0.15 * (0.05)	−0.13 ** (0.04)	−0.12 * (0.04)
Community Arrest Rate	−0.03 (0.08)	−0.03 (0.08)	0.07 (0.07)	0.06 (0.07)

Note. School engagement, peer support, delinquency peers, both parents, financial strain and age are time-varying covariates (level 1). Maternal depressive symptoms, Black, Hispanic, birth year, and community arrest rate are time-stable covariates (level 2). All non-binary covariates are grand-mean centered with the exception of Age, which is centered at 14. Among mother-son dyads, linear growth best represented the change in delinquency across age. Among mother-daughter dyads, quadratic growth best represented the change in delinquency across age.

Abbreviations. b=coefficient, SE=standard error

⁺
p<.10,

*
p<.05,

**
p<.01 (two-tailed test)