

The Effects of Maternal Depression on Child Outcomes during the First Years of Formal Schooling

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Abstract: Depression among parents, particularly maternal depression, is an important factor in children's lives. Among mental health disorders, depression is one of the most common and can be a debilitating and chronic condition. Little research has examined the effect of maternal depression on children's school-related outcomes during the early years of formal schooling. Children's success in elementary school is important for their later school and life outcomes. Using a nationally representative sample of nearly 17,000 children; we examine the association between the timing, persistence, and severity of maternal depression, measured in kindergarten and third grade, and children's school behaviors, academic achievement, and school absences in third and fifth grades. Results indicate that persistent maternal depression predicts more negative behaviors, smaller achievement gains, and increased school absences. Implications for policy and practice are discussed.

Running Head: Maternal depression and school-age outcomes

The Effects of Maternal Depression on Child Outcomes during the First Years of Formal Schooling

Depression among parents, particularly maternal depression, is an important factor in children's lives. Among mental health disorders, depression is one of the most common and can be a debilitating and chronic condition. Depression is associated with many negative outcomes and difficulties throughout the life course (Miech & Shanahan, 2000; Teitler & Reichman, 2008).

Women are nearly two times more likely than men to experience depression (Kessler, 2003). Over 10 percent of women ages 18 to 39 suffer from depression at any given time, with lifetime prevalence of Major Depressive Disorder (MDD) for women estimated at over 20 percent (CDC, MMWR 2012; Curry et al., 2014). Nearly 75% of those who have experienced an episode of depression will have a subsequent episode (Keller & Boland, 1998; Kessler, Zhao, Blazer, & Swartz, 1997). Individuals with depression can have difficulty maintaining relationships and have increased negative interactions with others (Coyne, 1976). Mothers with depression can have difficulty parenting, have more negative interactions with their children, and have been found to provide less cognitive stimulation (Kiernan & Huerta, 2008; Turney, 2012).

Parental capacity to support children through elementary and middle school is influenced by many factors, including parents' mental health. Parents play an important role in students' engagement with and success in school. Students' perceptions of support from parents and family cohesion have been linked to student competence (Connell, Spencer, & Aber, 1994; Wentzel, 1998) and parental neglect or lack of support is linked to school failure (Glasgow et al., 1997). Children's early success in school in terms of both achievement and behavior has been linked to subsequent success (Duncan, et al., 2007; Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011; Raver, 2003). Given the links between children's early achievement,

behavior, and attendance for later school-related outcomes, it is important to understand the association between maternal depression and these outcomes across elementary school.

While a large body of research explores the association between maternal depression and child development, several key questions remain. The extant literature has focused largely on the effects of maternal depression on children prior to school entry. Little research has examined the effect of maternal depression on school-aged children's classroom behaviors, academic achievement, and school attendance.

Among the few studies that have examined the relationship between maternal depression and children's developmental outcomes in elementary school, little attention has been given to the importance of the timing, persistence, or severity of maternal depression. The current study aims to address this gap in the literature. Using a nationally representative longitudinal sample of kindergarteners, we examine the relationship between maternal depression and children's school behaviors, academic achievement, and attendance. We explore how the timing, persistence, and severity of maternal depression relate to these school outcomes in third and fifth grades.

Maternal Depression and Child Development

Theoretical perspective

Both life course and developmental theories posit that maternal depression is likely to influence children's school behavior, achievement, and attendance. Life course theory suggests that development is determined, in part, through responses to changes in the contexts in which development occurs. From this perspective, the association between a mother's depression and her child's school outcomes may vary depending on when in the child's life it occurs, whether the mother's depression is chronic or episodic in nature, and the severity of her depression (Elder & Shanahan, 2006).

Theory and research indicate that maternal depression that takes place earlier in a child's life will likely affect the child more than maternal depression experienced during later years (Elder & Shanahan, 2006; Shonkoff & Phillips, 2000). This is due, in part, to the fact that early experiences are particularly salient for children's developmental outcomes (Shonkoff & Phillips, 2000). Families are more influential for younger children than for older children and adolescents who are typically more influenced by school experiences and their peers (Bronfenbrenner & Morris, 2006; Elder & Shanahan, 2006; Shonkoff & Phillips, 2000). As children move from early to middle childhood, the proximal contexts of their lives expand to include school and peers (Bronfenbrenner & Morris, 2006). Maternal depression is associated with negative interactions with children and less optimal parenting during early childhood (Kiernan & Huerta, 2008; Turney, 2012).

Young children may be more susceptible to the effects of maternal depression given that the home and familial contexts are more salient for them. Thus, maternal depression early in elementary school, when children are still very young, might be more detrimental to their school outcomes and set them on a less positive trajectory than maternal depression experienced later in elementary school or high school, when peer relationships become particularly important (Magnusson & Stattin, 2006). At the same time, theory and research do not clearly indicate that maternal depression is more detrimental for children at any particular age, and scholars have argued that as children develop and their capacities for both coping and understanding change, parental psychopathology might affect them in different ways and for different reasons (Cummings & Davies, 1994). Further, the effects of maternal depression on child outcomes has been documented from infancy through adolescence, with no specific age group appearing to be particularly vulnerable or resilient (Cummings & Davies, 1994; Rutter, 1990).

While children of depressed mothers are more likely to encounter a variety of disadvantages than children of non-depressed mothers, those children whose mothers are chronically depressed—for whom maternal depression persists over time or occurs multiple times—may be more vulnerable than children whose mothers experience a single episode of depression (Cummings & Davies, 1994). Children whose mothers experience a single episode of depression may experience few, if any, lasting negative impacts; but children whose mothers are persistently depressed may be more likely to accumulate disadvantage over this extended period and thus be more likely to experience lasting negative effects (Campbell, 2010). Mothers who experience a single episode of depression might be more capable of coping with the illness and, given a relatively brief duration and lack of reoccurrence, their children may only experience negative consequences of the mother's depression during the episode, if at all, rather than experiencing lasting negative effects (Campbell, 2010). Neither developmental nor life course theories suggest which might matter more for children's development, the timing of maternal depression or the persistence.

Beyond the timing and persistence of depression, another potentially important factor related to the effects of maternal depression on children is the severity of the depression. Mothers with major depressive disorder (MDD), a more severe form of clinical depression that is debilitating and interferes with normal functioning (National Institute of Mental Health, 2011), are likely less able to meet their children's day to day needs. MDD interferes with all aspects of a person's life including the quantity and quality of parenting (Gotlib & Goodman, 1999; Kiernan & Huerta, 2008). Thus, we might expect children whose mothers have MDD to experience more negative effects. Indeed, evidence indicates that both chronicity and severity of maternal

depression predict more negative child outcomes at age 5 (Brennan, Hammen, Andersen, Bor, Najman, & Williams, 2000).

Maternal depression is more common among economically disadvantaged families (Belle, 1990), and some evidence suggests that maternal depression might have a larger negative effect on child well-being among families with low incomes (Goodman et al., 2011). Mothers living in poverty are more likely to have additional stressors that limit their ability to compensate for or cope with depression or to seek treatment. People with lower levels of education and non-white people are much less likely to receive treatment for depression (Olfson, Marcus, Druss, Elinson, Tanielian, & Pincus, 2002). High levels of familial stress related to poverty may mediate the relationship between maternal depression and child well-being (Dawson et al., 2003). However, the existing literature is mixed with regard to whether higher levels of income or maternal education buffer children from the negative effects of maternal depression (Augustine & Crosnoe, 2010; Goodman et al., 2011; Turney, 2011, 2012). Much of the empirical literature linking maternal depression to children's well-being has focused on maternal depression experienced from birth through preschool and its associations with children's behavioral outcomes.

Maternal depression and young children

Maternal depression consistently predicts both more negative parenting practices at age 3 (Kiernan & Huerta, 2008) and more negative behavioral outcomes for children in early childhood (Goodman & Gotlib, 2002; Turney, 2012). The association between maternal depression and children's behaviors likely results from a combination of genetic similarities and from a child experiencing more negative parenting practices. Mothers who are depressed while their children are very young, on average, have more negative interactions with their children

than non-depressed mothers (Kiernan & Huerta, 2008; Turney, 2012). Maternal depression has been linked to higher levels of both internalizing and externalizing problem behaviors among children in early childhood (Goodman et al., 2011).

Maternal depression is associated with children's developmental outcomes when depression and child outcomes are measured concurrently (e.g., Brennan, et al., 2000). Episodic depression does not always have a lasting association with children's behavioral outcomes. However, recurrent maternal depression in early childhood is negatively associated with subsequent child behavioral outcomes (Giles, Davies, Whitrow, Warin, & Moore, 2011; Turney, 2011). Both the severity and chronicity of maternal depressive symptoms predict child behavioral and cognitive outcomes at age five, with children of mothers whose depression was both chronic and severe experiencing the most negative behavioral outcomes (Brennan et al., 2000).

Maternal depression and school-age children

Maternal depression experienced prior to school entry has been linked to more negative child outcomes. Yet, less is known about the association between maternal depression experienced during the early school years and children's success in school. Theory and research suggest that during the first years of elementary school children may be vulnerable to the negative outcomes associated with maternal depression (Elder & Shanahan, 2006; Kalil, Ryan, & Corey, 2012; Shonkoff & Phillips, 2000). Thus, maternal depression that occurs early in a child's school trajectory may have important implications for school behavior, achievement, and attendance.

A few studies have focused on elementary school students, finding that children of mothers with depression had more negative school behaviors and lower achievement test scores.

Children whose mothers were depressed when they were between ages five and seven had increased negative behaviors at age seven (Kim-Cohen, Moffit, Taylor, Pawlby, & Caspi, 2005) and lower achievement test scores (Turney, 2011). Kindergartners whose mothers were concurrently depressed had higher externalizing and internalizing behavior problems and lower reading skills in kindergarten (Ashman, Dawson, & Panagiotides, 2008; Essex et al., 2001; Kurstjens & Wolke, 2001). Maternal depression measured when the child was in kindergarten predicted lower levels of fifth grade reading and math achievement and teacher-rated approaches to learning (Bodovski & Youn, 2010). While these studies typically find a negative association between maternal depression and children's school-related outcomes, research has yet to examine the extent to which child outcomes vary by the timing, severity, or persistence of maternal depression.

Some evidence also suggests that the influence of maternal depression on elementary school children may vary by maternal education. Augustine and Crosnoe (2010) found that among mothers with a high school degree or less, maternal depression predicted both lower levels and smaller gains in achievement for their children from preschool through fifth grade. In contrast, the authors found that maternal depression was not associated with elementary school achievement trajectories among children of more educated mothers.

To date, few studies of elementary school-age children have focused explicitly on the relationship between the timing, severity, and persistence of maternal depression and children's school-related outcomes despite the fact that life course theory and developmental research suggest that both timing and persistence likely matter (Elder & Shanahan, 2006; Shonkoff & Phillips, 2000). Having a mother who is depressed during the earliest years of school may negatively affect a child's trajectory with regard to behaviors and academic achievement.

Further, children of persistently depressed mothers are likely to experience more difficult or withdrawn interactions with their mothers than their counterparts in homes with a mother who experiences an episode of depression or whose mothers are not depressed. Regularly experiencing more negative interactions with a depressed mother could be detrimental for children's school-related outcomes.

The Present Study

Children's behavior, academic achievement, and attendance in elementary school are important for their later school and life success. Yet, we know relatively little about the relationship between maternal depression and children's school behaviors, achievement, and attendance in elementary school. Our study contributes to the body of research that aims to understand how having a depressed mother shapes children's development during elementary school by investigating the following questions.

- Do the timing, persistence, and severity of maternal depression predict children's behaviors, achievement, and school attendance from kindergarten through fifth grade?
- Is the relationship between the timing, persistence, and severity of maternal depression and elementary school outcomes more pronounced among socioeconomically disadvantaged families or mothers with lower levels of education?

Drawing on both prior research and life course theory, we hypothesize that having a depressed mother during kindergarten will be associated with subsequent negative behaviors, lower achievement gains, and more school absences. We anticipate that children whose mothers are depressed during kindergarten will experience more lasting negative effects than those children whose mothers become depressed when the child is in third grade. We test another hypothesis, that children whose mothers are persistently depressed, as opposed to children whose

mothers report a single episode of depression, will experience larger and longer lasting negative effects on school behavior, achievement, and attendance. We also expect that severity of depression will be an important factor in children's outcomes, such that children whose mothers have more severe symptoms will have worse outcomes than those whose mothers report less severe depressive symptoms. Finally, we expect these relationships to be more pronounced among economically disadvantaged families, where economic disadvantage is defined as a family income below 185% of the federal poverty line. We examine differences by maternal education and child gender; however, based on conflicting results of prior research in this area, we are agnostic as to whether to expect differential associations for these groups.

Methods

Data

To address these questions, we use data from the Early Childhood Longitudinal Study, Kindergarten Cohort (ECLS-K), a large, longitudinal, nationally representative sample of children who were in kindergarten in 1998-99. Information about the ECLS-K study, measures, and sample come from the study's user's manual (Tourangeau, Nord, Le, Sorongon, & Najarian, 2009). The ECLS-K used a multistage probability sampling design to select a nationally representative sample of kindergarteners in 1998-99. The ECLS-K contains a wealth of information about children's school experiences from kindergarten through eighth grade including surveys of parents, teachers, and students as well as direct assessments of sample children. We use data from the fall and spring of kindergarten, and spring of first, third, and fifth grades.

We use multiple imputation in the analyses that follow, imputing both independent and dependent variables. Our analytic sample is also restricted to individuals who had information

on absences for at least one time point, resulting in approximately 16,940 children.¹ Missing data on individual variables ranged from zero to nearly 35%. Indicators for region of the country and urbanicity had no missing observations. Our set of control variables, describing children's background and home environments, were used as auxiliary variables in our imputation models (Allison, 2009). Multiple imputation was conducted using the MI command in Stata 12.0 (Statacorp, 2011), which is based on multivariate normal regression and follows the NORM method outlined in Schafer (1997). Twenty-five imputed data sets were generated in order to minimize the falloff in statistical power (Graham, Olchowski, & Gilreath, 2007; McCartney, Bub, & Burchinal, 2006).

Table 1 presents descriptive statistics for the sample. The variables listed are the control variables used in the regression analyses that follow. Over half (56 percent) of the students in the sample are White, 14 percent are African-American, and 17 percent are Hispanic. At the fall of kindergarten, 22 percent of the sample lived in households headed by a single parent, and 10 percent lived in homes where English was not the primary language.

Measures

School behaviors. Children's behaviors in school are measured using teacher responses to a self-administered questionnaire that included the Social Rating Scale (SRS), designed specifically for the ECLS-K. Teachers assessed all sampled children in their classrooms in the fall of kindergarten and the spring of kindergarten, first, third, and fifth grades. The SRS used in the ECLS-K is adapted from the Social Skills Rating System ([SSRS] Gresham & Elliott, 1990). We use the two measures of problem behaviors—internalizing and externalizing – and a measure

¹ Sample sizes are rounded to the nearest 10 throughout in accordance with the policy for restricted-use ECLS-K data.

of approaches to learning. The measures were constructed from questionnaire items by ECLS-K staff.

Teachers rated sample students on the items within each domain on a four point scale 1= “never” and 4= “very often”. The reported test-retest reliabilities of these scales for the full sample range from .76 to .91. The five-item externalizing problem behaviors scale, on which sample children averaged 1.62 in the fall of kindergarten rates the frequency with which a child argues, fights, gets angry, acts impulsively, and disturbs ongoing activities. The four-item internalizing problem behaviors scale rates a child’s anxiety, loneliness, low self-esteem, and sadness. In the fall of kindergarten, the average score on the measure of internalizing problem behaviors was 1.54. The approaches to learning scale includes seven items that measure the child’s attentiveness, task persistence, eagerness to learn, learning independence, flexibility, and following classroom rules.

Student achievement. Children were given direct assessments in language and literacy (reading) and mathematics at the fall of kindergarten and spring of kindergarten, first, third, and fifth grades. The tests were administered individually by ECLS-K staff. The assessments were designed specifically for the ECLS-K using Item Response Theory to allow for the examination of growth over time and tests proficiency in mathematics at nine levels and in reading at ten levels (Tourangeau et al., 2009). The ECLS-K math assessment measured children’s conceptual and procedural knowledge and problem solving skills, and scores range in reliability from .91 to .95 (Tourangeau et al., 2009). In kindergarten, the average score on the math achievement test was 26.18, and by fifth grade children were scoring an average of 124.12. The reading test measured children’s basic skills, vocabulary, and comprehension, and the reliability of the IRT

based scores range from .87-.96 (Tourangeau et al., 2009). Average scores ranged from 35.41 for reading in the fall of kindergarten to 150.50 in the spring of fifth grade.

School Absences. School absence data come from school administrative records in the ECLS-K restricted-use dataset. The records contain school administrator reports of the number of days that the student was absent during the kindergarten, first, third, and fifth grade school years. We combined measures of both excused and unexcused absences to create a single measure of total number of days absent in a given school year. We also created an indicator for having a high absence rate. This is a dichotomous variable indicating whether a student missed more than 10 days in a given year.

Maternal depression. Our primary independent variable of interest is a measure of maternal depression. In the ECLS-K, mothers reported on their depressive symptoms at three waves of data collection, when the focal child was in kindergarten, in third grade, and in eighth grade. We use the kindergarten and third grade measures. Depression was measured for mothers of ECLS-K focal children using the short form, 12-item version of the Center for Epidemiologic Studies Depression Scale (CES-D), a valid and reliable measure of depression (Radloff, 1977). Using the recommended scoring procedures, we combined responses to all of the items to create a raw symptom score ranging from 0 to 36. For our analyses, we use an indicator of whether an individual scored 10 or above on the CES-D to indicate clinically significant depression (Nord, Andreassen, Branden, Dulaney, Edwards, Emore, & Hilpert, 2004). We also ran our analyses using the cutoff of 15 or above to test whether a more severe level of maternal depression was differentially related to child outcomes (Nord et al., 2004).

Because of our interest in the timing and persistence of maternal depression, we created a number of mutually exclusive measures. We create indicators of whether a child's mother was

depressed (scored 10 or above on the CES-D) only during kindergarten, only in the third grade year, or depressed in both years. Thus, our mutually exclusive variables include never depressed (the omitted category in the regression analyses that follow), depressed only at time point one (kindergarten), depressed only at time point two (third grade) or depressed at both time points (kindergarten and third grade). We refer to our measure as “depression”. However, a more precise description is indicator of clinically significant depressive symptomology, or moderate depression. We also create the same mutually exclusive variables to test for differences in the severity of depression, coding those scoring 15 or above as depressed.

Child, home, and family characteristics. Because characteristics of children and families are likely correlated with both maternal depression and school outcomes, we control for a wide range of potential confounds. We control for child race/ethnicity, age, sex, parent-rated health, and preschool participation as well as fall of kindergarten math and reading achievement scores and a general knowledge test score. In addition to child characteristics, we control for home and family background variables including geographic region, urbanicity, number of books in the home, frequency with which parents report reading to child, maternal work patterns prior to kindergarten, and family income. We also control for home environment factors such as family structure, number of siblings, home language, and maternal education. The complete list of control variables is displayed in Table 1.

Analytic Approach

To address our main research questions, we estimate two sets of models for the two different levels of severity (10 point cutoff and 15 point cutoff) of maternal depression. The model takes the form:

$$(1) \text{Behave}_{iGR3} = a_1 + \beta_1 \text{KindergartenOnly}_{iGR3} + \beta_2 \text{ThirdGradeOnly}_{iGR3} + \beta_3 \text{DepressedBoth}_{iGR3} + \beta_4 \text{Ach}_{iFK} + \beta_5 \text{Behave}_{iFK} + \beta_6 \text{Child}_{iFK} + \beta_7 \text{Fam}_{iFK} + \varepsilon_i$$

Where Behave_{iGR3} is the teacher-reported behavior in one of the three domains, approaches to learning, externalizing behaviors, or internalizing behaviors, for child i in the spring of third grade (GR3). $\text{KindergartenOnly}_{iGR3}$ is a dichotomous variable indicating that the child's mother was depressed during kindergarten, but not when the child was in third grade. $\text{ThirdGradeOnly}_{iGR3}$ is a dichotomous indicator of whether child i 's mother reported depressive symptomology during the third grade year but not when the child was in kindergarten. $\text{DepressedBoth}_{iGR3}$ is a dichotomous variable indicating maternal depression at both kindergarten and third grade. Ach_{iFK} is the fall of kindergarten measure of child i 's achievement in reading, mathematics, and general knowledge. Behave_{iFK} is the fall of kindergarten teacher reported measure of child i 's classroom behaviors. Fam_{iFK} and Child_{iFK} are sets of family background and child characteristics included to control for characteristics that might be correlated with both maternal depression and the outcomes of interest. Finally, a_1 is a constant, and ε_K is a stochastic error term. We estimate this model for third and fifth grade behavioral outcomes as well as for third and fifth grade reading and mathematics achievement and attendance outcomes. We also estimate a logistic regression model using the same independent variables described above using our indicator of a high absence rate (greater than 10 absences in a given year) as the outcome.

The effects of the independent variables of interest are estimated by β_1 , β_2 , and β_3 , which, if correctly modeled, can be interpreted as the relationship between a child's having a mother with depression at either one of or both time points and the given outcome of interest, relative to those children whose mothers never report depression (the reference category). We also conduct post-hoc tests for statistically significant differences between β_1 , β_2 , and β_3 to allow us to formally

test these comparisons. A key challenge in our approach is the threat of omitted variable bias, which occurs if family or child characteristics are correlated both with maternal depression and measures of the students' behavior, achievement, or attendance and are omitted from our model. Our strategy for reducing bias in our coefficients of interest is to estimate a model of the form of equation (1) that includes measures of potentially confounding child and family characteristics.

Because research has found differences in rates of maternal depression by family economic circumstance and differences in the relationship between maternal depression and child outcomes by maternal education and child gender, we estimate these models separately for economically disadvantaged children (below 185% of the poverty line) and those children whose mothers reported having obtained lower levels of education (some high school or less). We also examine whether or not more severe levels of maternal depression matter differentially for school outcomes by estimating the above models using cutoff scores of 15 or above on the CES-D. In all of our models, standard errors are clustered at the kindergarten classroom level to adjust for the non-independence of children within classrooms.

Results

As shown in Table 1, 13 percent of sample mothers reported clinically significant depression, using the cutoff of 10, during only the kindergarten year and 16 percent reported depression only when their child was in third grade. Ten percent of sample mothers had CES-D scores indicating depression at both kindergarten and third grade (persistent depression).

Table 1 also displays descriptive statistics by the categories for timing and persistence of maternal depressive symptoms. The second column shows results for children whose mothers CES-D scores indicated depression in kindergarten but not third grade. The third column represents those children whose mothers were depressed only at third grade. The fourth column

includes children whose mothers reported clinically significant depressive symptomology at both kindergarten and third grade, and the final column shows descriptive statistics for children whose mothers never reported depressive symptomology that was clinically significant. Children whose mothers are persistently depressed are from more disadvantaged backgrounds than their peers whose mothers experience only episodic depression or whose mothers never experience depression, with lower family income, mothers with less education, and increased likelihood of living with a single parent.

Table 2 shows means for outcomes of interest for sample students in kindergarten, first, third, and fifth grade for the full sample as well as for the categories we created indicating the timing and persistence of maternal depression. Children whose mothers reported clinically significant depressive symptoms at any point in time, on average, miss more days of school each year and are more likely to miss more than two weeks of school. Children with persistently depressed mothers miss more school than those in any of the other categories. A similar pattern is observed for our other outcomes of interest; approaches to learning, externalizing and internalizing behavior problems, and achievement. As shown in the table, means are statistically significant across these mutually exclusive groups in most cases.

To investigate the association between maternal depression and outcomes of school behavior, achievement, and absences in third and fifth grades, we estimate models of the form of equation (1) presented above. Results showing the relationship between maternal depression using the cutoff score of 10 or above on the CES-D are shown in first set of columns of Tables 3-5. To investigate the association between more severe maternal depression and school behavior, achievement, and absences, we estimate models of the form of equation (1) using a cutoff of 15 or above on the CES-D. The latter columns of Tables 3-5 present results from these models. The

independent variables of interest are movement out of depression (depressed at kindergarten but not in third grade), into depression (not depressed at kindergarten, depressed in third grade), and persistent maternal depression (depressed at both time points).

Classroom Behaviors. Table 3 presents results using maternal depression to predict children's approaches to learning and externalizing and internalizing behaviors in the spring of third and fifth grades using the two different measures of severity of maternal depression. All models shown in Table 3 include the full set of control variables listed in Table 1 and outcomes are standardized to a mean of 0 and a standard deviation of 1 so that coefficients can be interpreted in standard deviation units, or β s. Positive values on the measure of approaches to learning indicate more positive behavior, while positive values on the measures of externalizing and internalizing behaviors indicate more problematic behaviors.

Results indicate that, for most outcomes, children whose mothers were depressed at kindergarten but not in third grade had more externalizing problems in both third and fifth grades than those children whose mothers were never depressed. Interestingly, among children whose mothers were depressed only in third grade, we find only one statistically significant association, for fifth grade internalizing behavior problems. Persistent depression—having a mother who was depressed in both kindergarten and third grade—relative to those children whose mothers never report clinically significant depression, is statistically significantly associated with internalizing and externalizing behavioral problems and approaches to learning in third and fifth grades. Coefficients range from approximately 0.12 standard deviations for approaches to learning measured at third grade to 0.19 standard deviations for internalizing problem behaviors measured at the end of third grade. Results of post-hoc *t*-tests indicate that in many cases, negative effects for children of mothers who are persistently depressed are statistically significantly larger than

effects for children whose mothers were depressed at only a single point in time (kindergarten or third grade).

Columns 7 through 12 show results for specifications using a cutoff of 15 or above, as opposed to 10 or above, on the CES-D. While coefficients for the cutoff of 15 or above are consistently larger than those estimated for the cutoff of ten or above, sometimes more than twice as large, *t*-tests revealed no statistically significant differences across the cutoffs. This is likely in part due to the much larger standard errors in the models using the cutoff of 15 or above.

Academic Achievement. Table 4 shows results for models using indicators for the timing and persistence of maternal depression predicting third and fifth grade achievement using both the 10 and 15 cutoffs on the CES-D. The results presented in Table 4 include the full set of control variables shown in Table 1 and the outcomes are standardized. As the table indicates, achievement outcomes for children whose mothers were depressed only in the kindergarten year are similar to those for children whose mothers were never depressed (the reference group), with the exception of fifth grade reading. Interestingly, children whose mothers were depressed only in third grade has significantly smaller achievement gains in reading in both third and fifth grades, approximately .05 standard deviations, relative to children whose mothers were never depressed. Children whose mothers were depressed at both points in time have significantly smaller achievement gains in both third and fifth grades, with estimated coefficients ranging from -.07 to -.13 standard deviation units. Turning to columns 5-8, Table 4 shows the same pattern of results among children whose mothers report more severe depression (scoring 15 or above on the CES-D). Similar to results for child behavioral outcomes, the estimated coefficients are larger than those using the 10 or above cutoff, however, differences are not statistically

significant. *T*-tests also suggest that children of mothers who were persistently depressed had smaller achievement gains than children whose mothers were depressed only in kindergarten. However, results were generally not statically significantly different between children whose mothers were persistently depressed and those whose mothers were depressed only in third grade.

Attendance. Table 5 presents results from models predicting both total absences and the likelihood of having a high absence rate in third and fifth grades using the measure of moderate depression (columns 1-4), followed by more severe depression (columns 5-8). As shown in columns 1-4, maternal depression at a single point in time (kindergarten or third grade) is statistically significantly associated with likelihood of having a higher absence rate in both third and fifth grades relative to children of mothers who were not depressed at either point in time (the omitted category). Children of mothers who were depressed at both time points missed an average of 1 more day of school in both third and fifth grades compared to children whose mothers were never depressed. In terms of the likelihood of having high absence rates, having a mother who was depressed at both kindergarten and third grade (persistently depressed) is associated with a statistically significantly higher likelihood of high absences in fifth grade (odds ratio of 1.4). The pattern of results was similar using the measure of more severe depression (columns 5-8).

Additional analyses. We ran a number of subgroup models in order to explore whether the relationship between the timing, persistence, and severity of maternal depression and child achievement and behavioral outcomes differed for children from families with low income and mothers with low levels of education. Results (available upon request) indicate almost no

statistically significant interactions for these groups, suggesting no consistent differences in the relationship between maternal depression and student outcomes across these subgroups.

Discussion

While prior research has explored the relationship between maternal depression and child outcomes for young children prior to school entry, relatively little research has examined the association between the timing, persistence, and severity of maternal depression and child outcomes in elementary school. We test hypotheses positing a negative association between maternal depression and children's behaviors, academic achievement, and school attendance in third and fifth grades. Further, we examine whether the timing, persistence, or severity of maternal depression is differentially associated with these school-related outcomes.

As both theory and prior research (Campbell, 2010; Elder & Shanahan, 2006; Shonkoff & Phillips, 2000) indicate that variation in both the timing and persistence of maternal depression is likely to be important for determining whether a mother's depression has lasting negative effects on her child, we examine whether the timing or persistence of maternal depression in elementary school predicts children's school outcomes in third and fifth grades. Our results indicate that persistent maternal depression—in this case having a mother with depression in both kindergarten and third grade—is associated with more negative school-related outcomes in third and fifth grade in terms of behaviors in school, academic achievement, and school attendance. In contrast, a single episode of depression, either when the child was in kindergarten or third grade, had few negative associations with third or fifth grade achievement outcomes, although results suggest negative effects on school-related behavioral outcomes. Thus, our findings suggest a somewhat complex association between a single episode of maternal

depression, with lasting effects for child behavioral outcomes, but few effects for child academic achievement as measured by test scores.

Our results support the notion that maternal mental health is an important determinant of young children's school-related outcomes. This is likely due to the fact that the home is the primary influence on young children's development (Elder & Shanahan, 2006; Kalil et al., 2012) and that persistent disadvantage—in this case defined as having a mother who is depressed when is a child is in both kindergarten and third grade—can have cumulative negative effects on child outcomes (Elder & Shanahan, 2006). Thus, our findings contribute to a body of theory and research suggesting that children whose mothers are persistently depressed are at the greatest risk of experience negative outcomes (Giles et al., 2011; Turney, 2011).

Many women experience a single episode of depression (CDC, MMWR 2012; Curry et al., 2014). Our study suggests that for school-age children these single episodes of maternal depression are not as influential for their school outcomes as persistent maternal depressive symptomology. This result is consistent with research that suggests that children of persistently depressed mothers may be more likely to accumulate disadvantage and therefore be more likely to experience lasting negative effects (Campbell, 2010).

While our findings regarding timing and persistence make a contribution to research aiming to understand the nuanced influence of maternal depression on children, it is important to consider the fact that once an individual has experienced an episode of clinical depression, she is much more likely to become depressed in the future than someone who has never been clinically depressed (Greden, 2001; Monroe, Slavich, Torres, & Gotlib, 2007; Keller & Boland, 1998; Kessler, Zhao, Blazer, & Swartz, 1997). While our study suggests that episodic depression is less detrimental to children's elementary school performance and behavior, evidence supports the

notion that many of these mothers will likely have another episode of depression in the future, while their child is still progressing through school. This highlights the importance of treatment, education, and monitoring for individuals who are depressed.

We find similar effects of maternal depression for children whose mothers experience either moderate or more severe depressive symptoms. Because of this and because of the large body of evidence indicating that depression can be successfully treated for most people (Khan, Faucett, Lichtenberg, Kirsch, & Brown, 2012) through cost effective interventions (Lazar, 2010a, 2010b) including medication and psychotherapy, our results suggest that screening for depression in general, but particularly among mothers of young children, is important. Given the treatable nature of most diagnosed cases of depression, our findings support the potential for addressing this malleable home influence as a means not only of improving the well-being of mothers, but of their children as well.

We find no differences in the relationship between the timing and persistence of maternal depression and children's school-related outcomes by family income, maternal education or child gender. Prior research has resulted in mixed findings in a number of these areas. For instance, prior research suggests that maternal depression may have greater impacts in families with low maternal education and in non-white families (Olfson, Marcus, Druss, Elinson, Tanielian, & Pincus, 2002). Unlike Augustine and Crosnoe (2010), we do not find larger effects of maternal depression among children of mothers with lower levels of education. Likewise, in contrast to Goodman and colleagues (2011), we do not find larger effects of maternal depression among children from low-income backgrounds. While we did not directly examine child depression as an outcome, our lack of differential effects by child gender on all outcomes, including internalizing behavioral problems, contrasts with prior research that suggests maternal

depression may have a stronger impact on outcomes of depression for girls (Fergusson, Horwood, & Lynskey, 1995). It is important to note that that much of the prior literature relied on more frequent assessments of maternal depression during the elementary school years, while the ECLS-K measured maternal depression at only two points in time. However, the ECLS-K is also a more diverse, nationally representative sample of children than many of the samples used in prior research.

Although we find no differences in the relationship between maternal depression and children's school outcomes across these different groups, this does not imply that child outcomes will be similar across these subgroups. Evidence indicates that individuals with less education and lower income experience a higher incidence of depression (Lorant, Deliege, Eaton, Robert, Philippot, & Anseau, 2003). Alarming, individuals disadvantaged by less income and education are also less likely to receive treatment for depression (Olfson et al., 2002). Thus, while the relationship between maternal depression and child outcomes does not vary across subgroups, we know that mothers of children from disadvantaged backgrounds are both more likely to be depressed and less likely to be treated. This is particularly concerning given our findings regarding the negative effects of persistent maternal depression and the fact that disadvantaged children are, more generally, much more likely to experience multiple barriers to school success and are most vulnerable to the negative effects of cumulative disadvantage (Elder & Shanahan, 2006).

This study is not without its limitations. The data we use measures maternal depression at only two points in time – kindergarten and third grade. An important extension to our study will be a replication using data with both maternal depression and child outcomes measured at multiple points in time to be able to further explicate the importance of when maternal

depression occurs and how its persistence relates to children's school outcomes. However, despite our measurement limitations, our study relies on a large nationally representative sample of children, allowing us to examine results across diverse subgroups of children and contains measures on a wide range of elementary school outcomes of interest.

Finally, the data used in the current study are observational. While we use an extensive set of child and family controls to reduce the threats of selection and omitted variable bias, these threats remain plausible. Thus, the results of this study should be interpreted as correlational rather than causal.

Conclusion

Our main finding, that persistent maternal depression is associated with increased behavioral problems, decreased academic achievement and increased school absences in elementary school, suggests that interventions aimed at promoting school engagement and achievement should consider and address children's familial contexts. Specifically, interventions should involve the mothers in these families and, when relevant, should attempt to connect them to appropriate mental health services. Notably, our investigation is one of the first to explore the effect of maternal depression, a common and costly mental health condition, on children's school attendance.

Our results support the notion that maternal mental health has an important influence on school-related outcomes for children during elementary school. This connection suggests that calculations of the individual and societal costs of depression that fail to consider these effects are likely underestimates, given that they do not account for the potential spillover effects of maternal depression onto children's school-related outcomes.

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Table 1. Descriptive statistics for control variables of interest for full sample and by the timing and persistence of maternal depression

	Full Sample	Depressed Kindergarten not 3 rd Grade	Depressed only at 3 rd Grade	Depressed Kindergarten and 3 rd Grade	Never Depressed
	(1)	(2)	(3)	(4)	(5)
Fall K achievement and behaviors					
Math ^{bcdef}	26.18	24.93	24.62	22.87	27.39
Reading ^{bcdef}	35.41	34.00	34.10	32.43	36.48
General knowledge ^{bcdef}	22.48	21.36	21.23	19.29	23.51
Approaches to learning ^{bcdef}	2.98	2.91	2.91	2.82	3.03
Externalizing ^{cdef}	1.62	1.66	1.64	1.71	1.59
Internalizing ^{abcdef}	1.54	1.53	1.57	1.61	1.52
Maternal Depression Measures					
Depressed kindergarten only	0.13	1.00	0.00	0.00	0.00
Depressed 3rd grade only	0.16	0.00	1.00	0.00	0.00
Depressed kindergarten and 3rd grade	0.10	0.00	0.00	1.00	0.00
Child and family characteristics					
Female	0.49	0.48	0.49	0.47	0.50
White ^{abcdef}	0.56	0.52	0.47	0.40	0.62
Black ^{bcdef}	0.14	0.17	0.17	0.25	0.11
Hispanic ^{abcdef}	0.17	0.16	0.24	0.23	0.14
Asian	0.07	0.07	0.06	0.06	0.07
Age (months) ^e	68.47	68.52	68.27	68.45	68.51
Health Scale (1-5) ^{bcdef}	1.69	1.79	1.76	1.94	1.61
Number of biological siblings ^{bdef}	1.47	1.45	1.53	1.63	1.43
Single biological parent ^{bcdef}	0.22	0.27	0.27	0.34	0.17
English not primary home language ^{abef}	0.10	0.10	0.14	0.14	0.09
Parent reads to child ^{bcdef}	5.01	4.83	4.80	4.54	5.18
Number of children's books in home ^{abcdef}	73.09	67.34	62.93	53.94	80.14
Maternal education (years) ^{abcdef}	13.40	13.05	12.81	12.24	13.82
Mother worked before kindergarten ^{abef}	0.74	0.75	0.71	0.70	0.76
Income ^{bcdef}	\$52,411	\$44,898	\$44,213	\$33,406	\$59,316
Full day kindergarten ^{ef}	0.56	0.56	0.57	0.59	0.54
Center-based pre-kindergarten ^{bcdef}	0.56	0.51	0.49	0.40	0.62
Head Start ^{cdef}	0.13	0.16	0.17	0.25	0.09
West ^e	0.23	0.24	0.26	0.24	0.22
Midwest ^{ef}	0.25	0.25	0.22	0.22	0.27
Northeast ^{ef}	0.19	0.18	0.17	0.17	0.20
Urban ^{abef}	0.41	0.41	0.46	0.46	0.39
Suburban ^{cef}	0.38	0.36	0.35	0.33	0.40
Observations	16,940	2,200	2,670	1,730	10,340

Note: ^a signifies a statistically significant difference between columns 2 and 3; ^b a difference between columns 2 and 4; ^c a difference between columns 2 and 5; ^d a difference between columns 3 and 4; ^e a difference between columns 3 and 5; and ^f a difference between columns 4 and 5.

Table 2. Descriptive statistics for all outcomes for full sample and by timing and persistence of maternal depression

	Full Sample	Depressed Kindergarten not 3rd Grade	Depressed only at 3rd Grade	Depressed Kindergarten and 3rd Grade	Never Depressed
Teacher Rated					
Spring K learning ^{bcdef}	3.10	3.03	3.05	2.92	3.16
Spring K externalizing behavior ^{bcdef}	1.67	1.72	1.71	1.80	1.63
Spring K internalizing behavior ^{bcdef}	1.57	1.60	1.60	1.66	1.55
Spring 1st learning ^{bcdef}	3.04	2.95	2.98	2.82	3.11
Spring 1st externalizing behavior ^{cdef}	1.66	1.73	1.70	1.79	1.62
Spring 1st internalizing behavior ^{cdef}	1.59	1.65	1.62	1.69	1.56
Spring 3rd learning ^{bcdef}	3.06	3.00	2.99	2.85	3.12
Spring 3rd externalizing behavior ^{bcdef}	1.69	1.74	1.73	1.87	1.65
Spring 3rd internalizing behavior ^{bcdef}	1.62	1.66	1.66	1.77	1.59
Spring 5th learning ^{bcdef}	3.08	3.00	3.04	2.88	3.13
Spring 5th externalizing behavior ^{bcdef}	1.63	1.69	1.65	1.78	1.60
Spring 5th internalizing behavior ^{bcdef}	1.63	1.65	1.68	1.74	1.60
Achievement					
Spring K math ^{bcdef}	36.51	34.96	34.59	32.16	38.05
Spring K reading ^{bcdef}	46.55	44.76	44.92	42.67	47.94
1st grade math ^{bcdef}	61.54	59.25	58.48	54.98	63.74
1st grade reading ^{bcdef}	77.55	74.07	73.83	68.75	80.46
3rd grade math ^{bcdef}	99.19	96.26	94.36	88.84	102.32
3rd grade reading ^{bcdef}	127.21	123.30	121.42	113.83	131.15
5th grade math ^{bcdef}	124.12	121.39	119.45	114.13	126.94
5th grade reading ^{bcdef}	150.50	146.66	145.09	137.92	154.02
Total Absences (mean)					
Kindergarten ^{bcdef}	9.75	10.89	10.21	12.46	8.93
1 st grade ^{cdef}	7.95	9.08	8.66	10.19	7.16
3 rd grade ^{bcdef}	6.73	7.29	7.02	8.22	6.29
5 th grade ^{bcdef}	6.73	7.03	7.18	8.14	6.31
More than 10 absences (prop.)					
Kindergarten ^{bcdef}	0.34	0.39	0.38	0.45	0.30
1 st grade ^{bcdef}	0.27	0.30	0.31	0.36	0.23
3 rd grade ^{bcdef}	0.23	0.25	0.25	0.30	0.21
5 th grade ^{bcdef}	0.24	0.25	0.26	0.31	0.21
Observations	16,940	2,200	2,670	1,730	10,340

Note: ^a signifies a statistically significant difference between columns 2 and 3; ^b a difference between columns 2 and 4; ^c a difference between columns 2 and 5; ^d a difference between columns 3 and 4; ^e a difference between columns 3 and 5; and ^f a difference between columns 4 and 5.

Table 3. Coefficients and standard errors from OLS regression models predicting approaches to learning, externalizing, and internalizing outcomes from third and fifth grade using indicators of timing and persistence of maternal depression

	Score greater than or equal to 10 on CES-D						Score greater than or equal to 15 on CES-D					
	Third Grade			Fifth Grade			Third Grade			Fifth Grade		
	Learn	Extern	Intern	Learn	Extern	Intern	Learn	Extern	Intern	Learn	Extern	Intern
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Depressed kindergarten not 3rd grade	-0.048 (0.027)	0.071** (0.025)	0.087** (0.031)	-0.073* (0.029)	0.065* (0.030)	0.039 (0.032)	-0.104** (0.037)	0.164** (0.045)	0.161** (0.047)	-0.147** (0.044)	0.124** (0.043)	0.090 (0.049)
Depressed only at 3rd grade	-0.049 (0.029)	0.053 (0.027)	0.057 (0.034)	-0.018 (0.031)	0.014 (0.030)	0.097** (0.029)	-0.069 (0.041)	0.076 (0.041)	0.079 (0.040)	-0.034 (0.039)	0.027 (0.038)	0.146** (0.040)
Depressed kindergarten and 3rd grade ^{ab}	-0.123** (0.033)	0.163** (0.036)	0.192** (0.034)	-0.123** (0.039)	0.117** (0.037)	0.150** (0.040)	-0.153* (0.073)	0.211** (0.068)	0.266** (0.075)	-0.143 (0.077)	0.158* (0.077)	0.202* (0.085)
Controls	X	X	X	X	X	X	X	X	X	X	X	X
Observations	16,940	16,940	16,940	16,940	16,940	16,940	16,940	16,940	16,940	16,940	16,940	16,940
R-squared	0.290	0.289	0.111	0.258	0.248	0.091	0.290	0.289	0.110	0.258	0.248	0.091

Note. Standard errors are clustered at the classroom level. Table 1 contains the full list of control variables.

** p<0.01, * p<0.05

^a Indicates statistically significant (p<0.05) differences between coefficient and the coefficient for depressed kindergarten not 3rd grade for a Welch's t-test for columns (2), (3), and (6)

^b Indicates statistically significant (p<0.05) differences between coefficient and the coefficient for depressed only at 3rd grade for a Welch's t-test for columns (2), (3), (4), (5), and (8)

Tests revealed no statistically significant differences between corresponding coefficients using >10 and >15 cutoffs.

Tests revealed no statistically significant differences between depressed kindergarten not 3rd grade and depressed only at 3rd grade

Table 4. Coefficients and standard errors from OLS regression models predicting reading and mathematics achievement from third and fifth grade using indicators of timing and persistence of maternal depression

	Score greater than or equal to 10 on CES-D				Score greater than or equal to 15 on CES-D			
	Third Grade		Fifth Grade		Third Grade		Fifth Grade	
	Math	Reading	Math	Reading	Math	Reading	Math	Reading
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Depressed kindergarten not 3rd grade	-0.015 (0.019)	-0.031 (0.022)	-0.011 (0.021)	-0.046* (0.022)	-0.032 (0.028)	-0.037 (0.030)	-0.012 (0.033)	-0.069* (0.033)
Depressed only at 3rd grade	-0.044* (0.019)	-0.054* (0.023)	-0.041 (0.023)	-0.050* (0.023)	-0.028 (0.027)	-0.056 (0.031)	-0.031 (0.031)	-0.064* (0.033)
Depressed kindergarten and 3rd grade ^{ab}	-0.080** (0.026)	-0.111** (0.025)	-0.071** (0.028)	-0.126** (0.028)	-0.128** (0.048)	-0.129** (0.050)	-0.113* (0.054)	-0.160** (0.050)
Controls	X	X	X	X	X	X	X	X
Observations	16,940	16,940	16,940	16,940	16,940	16,940	16,940	16,940
R-squared	0.548	0.550	0.507	0.527	0.548	0.549	0.506	0.527

Note. Standard errors are clustered at the classroom level. Table 1 contains the full list of control variables.

** p<0.01, * p<0.05

^a indicates statistically significant (p<0.05) differences between coefficient and the coefficient for depressed kindergarten not 3rd grade for a Welch's t-test for columns (1), (2), and (4)

^b indicates statistically significant (p<0.05) differences between coefficient and the coefficient for depressed only at 3rd grade for a Welch's t-test for column (4)

Tests revealed no statistically significant differences between corresponding coefficients using >10 and >15 cutoffs.

Tests revealed no statistically significant differences between depressed kindergarten not 3rd grade and depressed only at 3rd grade

Table 5. Coefficients and standard errors from OLS regression models predicting student absences and logistic regressions predicting whether students missed more than two weeks of school in third and fifth grades using indicators of timing and persistence of maternal depression

	Score greater than 10 on CES-D						Score greater than 15 on CES-D					
	Third Grade			Fifth Grade			Third Grade			Fifth Grade		
	Total Absences	Absent > 10 days	Odds Ratio	Total Absences	Absent > 10 Days	Odds Ratio	Total Absences	Absent > 10 days	Odds Ratio	Total Absences	Absent > 10 Days	Odds Ratio
Maternal Depression	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	
Depressed kindergarten not 3rd grade	0.574* (0.236)	0.172** (0.059)	1.188	0.243 (0.232)	0.131* (0.057)	1.139	1.108** (0.402)	0.128 (0.081)	1.137	0.300 (0.367)	0.160* (0.080)	1.174
Depressed only at 3rd grade ^c	0.372 (0.224)	0.328** (0.057)	1.389	0.490 (0.256)	0.350** (0.068)	1.419	0.466 (0.303)	0.105 (0.076)	1.111	0.773* (0.389)	0.138 (0.082)	1.147
Depressed kindergarten and 3rd grade ^{ab}	1.229** (0.290)	0.436** (0.068)	1.547	1.081** (0.320)	0.418** (0.069)	1.518	1.530* (0.633)	0.338* (0.144)	1.402	1.718** (0.642)	0.428** (0.149)	1.534
Controls	X	X		X	X		X	X		X	X	
Observations	16,940	16,940		16,940	16,940		16,940	16,940		16,940	16,940	
R-squared	0.047	0.030		0.053	0.031		0.046	0.026		0.053	0.029	

Note. Standard errors are clustered at the classroom level. Table 1 contains the full list of control variables.

** p<0.01, * p<0.05

^a indicates statistically significant (p<0.05) differences between coefficient and the coefficient for depressed kindergarten not 3rd grade for a Welch's t-test for columns (2), (3), and (4)

^b indicates statistically significant (p<0.05) differences between coefficient and the coefficient for depressed only at 3rd grade for a Welch's t-test for column (1)

^c indicates statistically significant (p<0.5) differences between the 10 and 15 cutoff estimates for columns (2) and (4) as well as (4) and (9)

Tests revealed no statistically significant differences between depressed kindergarten not 3rd grade and depressed only at 3rd grade