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# MATERNAL DEPRESSION AND CHILD BMI: LONGITUDINAL FINDINGS FROM A U.S. SAMPLE

**Cristiane S. Duarte, PhD, MPH**[a], **Sa Shen, PhD**[a], **Ping Wu, PhD**[a], and **Aviva Must, PhD**[b]

[a]Division of Child and Adolescent Psychiatry, Columbia University-NYSPI, 1051 Riverside Drive, New York, NY 10040

[b]Department of Public Health & Community Medicine, Tufts University, 136 Harrison Avenue, Boston, MA 02111

## Abstract

**OBJECTIVE—**To examine the association between maternal depression and child BMI from Kindergarten (K) to 5th grade.

**METHODS—**Analysis of four waves of data from the Early Childhood Longitudinal Study – Kindergarten (ECLS-K) spanning K to 5th grade. Maternal depressive symptoms (MDS) were measured by a brief version of the Center for Epidemiological Studies Depression scale. Data were analyzed using multiple regression analyses, adjusting for key covariates and potential confounders. The analytic sample was restricted to children of normal birth weight.

**RESULTS—**The relationship between MDS and child BMI varies by child gender and age. Among girls, severe MDS at K was related to lower BMI at 3rd grade (but not later at 5th grade) and to an increase in BMI from K to 3rd and K to 5th grades. Among boys, severe MDS at K was related to higher boys' BMI at 5th grade. When severe MDS occurred at 3rd grade, it was related to higher BMI at 5th grade among girls whereas no statistically significant relationship was found for boys. Low levels of physical activity in comparison to peers at 5th grade and more screen time on weekends at 3rd grade are likely mediators of the relationship between MDS and child BMI among girls, whilst among boys the relationship appears to be mediated by unhealthy eating habits.

**CONCLUSIONS—**Our findings, indicating developmental and gender differences in the relationship between maternal depression and child BMI, if confirmed, suggest that interventions addressing maternal depression may have concomitant impact on childhood obesity.

### Keywords

child; depression; development; gender; maternal; obesity

Corresponding Author, Cristiane S. Duarte, 1051 Riverside Drive, Unit #43, New York, NY 10032, Telephone: 212-543-5725; Fax: 212-781-6050, cd2003@columbia.edu.

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## Introduction

As children share with their parents key decisions regarding their own health behaviors, such as their diet or physical activity, to address childhood obesity effectively requires understanding parental factors. Depression is a highly prevalent disorder among women (1) with substantial consequences in their children's lives (2) and for which effective interventions, applicable to low-income, underserved populations (3) are available.

Studies about maternal depression as a factor influencing child relative weight have mostly focused on antenatal or post-partum maternal depression, and yielded a complex pattern of findings. Investigations in developing countries (4;5) reported that maternal depression early in life is related to child low birth weight or slower growth. In contrast, studies of populations otherwise healthy and living in resource-rich settings have not detected relationships between maternal depression and either child birth weight (6;7) or growth (8). In some of the rare instances where the relationship between maternal depression and child obesity was assessed among school-aged children, indirect and preliminary evidence was generated (9)(10)(11).

The relationship between maternal depression and obesity among school-age children in prior studies may have been obscured by the positive relationship between maternal depression in the antenatal or postnatal periods and child low birth weight or slower growth. Further, given convergent evidence suggesting that depression in girls, but not boys, is related to obesity (12;13), it is also possible that findings from prior results reflected unaccounted for gender differences. We therefore hypothesize that maternal depression would be related to higher child weight status and weight gain from Kindergarten to 5$^{th}$ grade among children of normal birth weight. We also expect such relationships to be mediated by obesity-related patterns of child physical activity/sedentary behaviors and unhealthy eating habits.

## Methods

We analyzed four waves of data (spring of Kindergarten, 1st, 3rd and 5th grade) from the Early Childhood Longitudinal Study, Kindergarten (ECLS-K, first assessment 1998–1999) (14). The ECLS-K is a longitudinal, nationally representative study of over 21,000 children, in almost 1,000 schools (public and private). Children were assessed individually at their schools and parents interviewed by telephone. As the pattern of growth of low birth weight children can be very specific (15), with low birth weight linked with rapid weight gain and obesity (16), we restricted the study population to children with birth weights greater than 2,000 grams.

Sample sizes for each study wave were: spring of Kindergarten (N=21,260), 1st (1999/2000; N=17,487), 3rd (2002; N=15,305) and 5th (2004; N=11,820) grades. Sample sizes decline by study wave due mostly to a decision to reduce study costs by following only a subsample of children who moved to another school, but sampling weights can be used to represent those not interviewed (17).

## Measures

**Child body mass index z-score (BMIz)—**Height and weight were measured at K, 1st, 3rd and 5th grades using a Shorr Board and a digital bathroom scale. BMI was calculated as weight in kilograms divided by height in meters squared. BMIz and cut-off points to define biologically implausible values were established based on the Centers for Disease Control and Prevention (CDC) sex-specific growth charts (18). BMIz missing values were 6.8%, 7.7%, 8.9% and 6.1% within each study wave, respectively. When values of either height or weight were missing, but not both, height or weight was imputed based on the mean value of the available CDC body size information for the specific gender-age group. Values imputed using this strategy did not exceed 0.5% of the total sample size for a given wave (exceptfor 1st grade, when it was 3.4%).

*Maternal depressive symptoms (**MDS**)* was assessed in two study waves (Kindergarten and 3rd grade) using the abbreviated 12-item version of the Center for Epidemiological Studies (CES-D-12) scale (19)(15)(20). In the abbreviated CES-D-12, each item is scored using a 4-point scale (never, some of the time, a moderate amount of the time, most of the time), and the total score ranges from zero to 36, with higher scores indicating a higher probability of depression. The 12 items included in the CES-D-12 were selected based on a factor analysis conducted in a national U.S. sample (21). In the ECLS-K, the CES-D-12 had high internal consistency in both times it was measured (alpha=0.86 and 0.99). Because cutoff points for the CES-D-12 have not been determined, we established a cut-off point based on a receiver operator characteristic (ROC) analyses testing the CES-D-12 against an external validator (maternal self-report of needing or receiving professional mental health help in the last 12 months). The resulting area under the curve (AUC) was 0.77 (95% CI=0.75–0.79) and a cutoff score of 15 yielded approximately equal numbers of false positives and false negatives, with specificity of 0.96 and sensitivity 0.75. Based on this analysis, we determined severe level of MDS as CES-D-12 score of 15 or higher. Based on the distribution of the scores, three other levels were determined: absent/minimal (score≤4), some symptoms (score≤9); moderate (score≤14). For longitudinal analyses, missing values on the CES-D-12 at Kindergarten (N=621 or 2.9%) were imputed using 3rd grade CES-D-12 values, when available.

## Obesity-related behaviors (ORB)

**Child Physical Activity—**[3rd, 5th grades]. Parents reported on child level of physical activity in relation to her/his peers (more, less, the same) during structured activities (sports or school physical activities), free time or during aerobic exercise. Children with lower levels of physical activity in two or more of these three areas were classified as having less activity than their peers, those having higher activity levels classified as having more activity and the remainder classified as having the same level of activity as other children.

**Child Screen Time—**[3rd, 5th grades] Parents also informed about screen time, the total number of hours and minutes per day that their children watchedTV or other videos during a typical weekday after 3pm and during a typical weekend day.

**Healthy Eating—**[5th grade] The ECLS-K Food Consumption Questionnaire (FCQ) was used to inquire about the kinds of food the children consumed in the prior 7 days when they were in 5th grade. Children were asked about their consumption of 10 specific foods and beverages, selected from 7 frequency options: child did not consume specific food/drink, consumed specific food/drink during the past 7 days: 1 to 3 times per week, 4 to 6 times per week, 1 time per day, 2 times per day, 3 times per day, or 4 or more times per day. We created a healthy eating index by, first, giving a score of one for each healthy food item consumed one time per day or more during the past seven days, including (1) green salad, (2) carrots, (3) other vegetables (not including potatoes) and/or (4) fruits (excluding fruit juice). The index also included information on unhealthy eating, that is two or more times per day during the past 7 days (5) eating a meal or snack from a fast food restaurant and/or (6) drinking Soda pop, sports drinks or fruit drinks that are not 100% fruit juice. Children who had not had items (5) and (6) received a score of one in the index. The healthy eating index ranged from 0 to 6.

**Other Relevant Factors—***Family Socioeconomic Status (SES)*, expressed as composite score based on annual family income, parental relationship status (single vs. both parents) and level of maternal education, as defined by the ECLS-K (14), with higher scores representing higher SES.

*Child Race/Ethnicity* was determined according to parental information about the child. The racial/ethnic distribution of the most prevalent groups at Kindergarten was 57% white, non-Hispanic, 14% African-American, non-Hispanic 17% Hispanic.

## Data Analysis

**Data Weighting—**We used propensity score weighting to adjust for potential attrition bias that may not have been adjusted for by existing study sampling weights(22). By using this adjustment, the follow-up better reflects the baseline sample which was nationally representative in 1998–1999. We used the following procedure: Non-response patterns at each data collection interval were examined by performing binary logistic regression with unit response vs. non-response as the outcome, and variables from baseline which were potential correlates of non-response as predictors using stepwise selection criteria (to enter the regression: p=0.20; to stay in the regression: p=0.05) allowing for 2-way interactions. An overall weight was estimated based on the reciprocal of the predicted probabilities for each one of the stages, which were then multiplied by sampling weights from each stage resulting in an overall weight for each participant. To avoid inflating variability, a quintile split was performed. Sampling and propensity scoring weights were used in all analyses.

**Descriptive and Regression Analyses—**After providing descriptive statistics, we compared mean BMIz at the four levels of MDS during K and 3rd grade. These analyses were performed in SUDAAN (23), to account for the clustered sampling effects. To examine the relationship between severe levels of MDS and child BMIz at different time points, we evaluated linear models where severe MDS at K or 3rd grade were related to child BMIz, adjusting for socio-demographic factors. For models with child BMIz at 3rd and 5th grades as the dependent variable, we evaluated linear regression models in SUDAAN (23). For

models with child BMIz from K to 5th grades as the dependent variable, we used multilevel linear models and included interview wave (expressed as a linear trajectory). Because the latter longitudinal models cannot be tested in SUDAAN, we used weighted analyses in the MIXED procedure in SAS, with restricted maximum likelihood estimation, including variables representing the sampling design to account for sampling clustering effects. The interaction term between time and MDS was tested in these models to evaluate the change over time in MDS in relation to child BMIz.

**Test of Mediation—**Mediation was evaluated only in the presence of significant association between severe level of MDS and child BMIz, by applying the principles of Baron and Kenny's (24). We considered only groups of models that represented plausible temporal sequences of events (e.g. MDS at K, ORB at 3rd grade and child BMIz from K to 5th grades). We used the Sobel test (24) to verify the significance of the indirect effect of MDS on child BMIz. Alpha of 0.05 was used to declare statistical significance.

## Results

As displayed in Table 1, there were no gender differences in BMIz at K, however, this indicator of relative weight was higher for boys than for girls at 3rd and 5th grades. About 9% of the mothers had severe levels of depression at Kindergarten, about 7.7% at 3rd grade and 1.3% at both time points (not shown in tables). The Pearson correlation between MDS in the two time points was 0.29.

Bivariate analyses indicated variation in child BMIz at K of girls according to level of MDS (Table 2), with girls of mothers with severe MDS having the *lowest* BMIz as compared to girls of mothers with non-severe MDS. Girls' BMIz at later waves (1st, 3rd, 5th grades) were not related to Kindergarten MDS. When MDS at 3rd grade was considered, an opposite pattern from the one at Kindergarten was observed among girls, with severe depression being related to *higher* BMIz of girls at 5th grade. Among boys, severe level of MDS at K was related to higher BMIz at 5th grade only. Using multiple regression analyses (Table 3), first both the two-way interaction between child gender and MDS at K and the three-way interaction between both factors with time were tested to assess the need to stratify models by gender ($F=4.23$; $p=0.0020$ and $F=8.22$; $p< 0.0001$, respectively). Second, we examined the prospective association between MDS at K and the following dependent variables: child BMIz at 3rd and 5th grades, and from K to 5th grade. Third, we assessed models where the main predictor was MDS at 3rd grade in relation to child BMIz at 5th grade.

Among girls, severe MDS at K was associated with *lower* BMIz at 3rd grade ($P = 0.01$), and lower BMIz from K to 5th grades ($P < 0.01$). At 5th grade, however, the association was not statistically significant ($p=0.1601$). Girls whose mothers had severe levels of MDS at K had a greater increase in BMIz compared with girls whose mothers had none/minimal MDS from K to 5th grades ($P < 0.01$), suggesting that girls of depressed mothers 'catch up' with girls of non-depressed mothers over this time period as displayed in Figure 1. Severe levels of MDS at 3rd grade were associated with *higher* BMIz among girls in 5th grade ($p=0.0480$). In contrast, for boys, severe MDS at K were prospectively associated with higher BMIz at

5th grade (P = 0.03). Severe MDS at 3rd grade were not related to boy's BMIz at 5th grade P = 0.57.

For statistically significant associations identified in Table 3, we examined follow-up models spanning the longest possible follow-up period (through 5th grade) to relate severe MDS to ORB (path a) and ORB to child BMIz controlling for MDS (paths b' and c'). As displayed in Table 4, for girls, severe MDS at K was related to lower child activity relative to peers at 5th grade (P = 0.048). This pattern indicates that the relationship between severe MDS at K and increase in BMIz from K to 5th grade was mediated by lower level of child physical activity compared to peers at 5th grade (Sobel P = 0.026). Additionally, severe MDS at K was associated with more screen time on weekends at 3rd grade (P = 0.02). High level of screen time on weekends at 3rd grade is a possible mediator of the relationship between severe MDS at K with increase in BMIz at 3rd grade (Sobel P = 0.026). Among boys, severe MDS at K was related to lower levels of healthy eating behaviors at 5th grade satisfying the first requirement for the occurrence of mediation (path a). For this specific obesity-related behavior, the second condition (path b') is also fulfilled, as healthy eating behaviors are also associated with child BMIz at 5th grade even after adjusting for MDS. In addition, severe MDS at K is associated with child BMIz at 5th grade, even after adjusting for healthy eating behaviors (c') (Sobel P = 0.032).

## Discussion

We sought to elucidate the relationship between maternal depression and child weight status and weight gain from Kindergarten to 5th grade, and explore whether any observed associations were mediated by child physical activity/sedentary behaviors and eating habits. Our findings suggest a complex relationship between maternal depression and children's BMI, which varies by child age and by gender. Among girls, severe maternal depression at K was related to lower BMI at 3rd grade (but not later at 5th grade) and to increases in BMI from K to 5th grades. Among boys, maternal depression at K was related to BMI at 5th grade, but not to change over time. For girls, when maternal depression occurred at 3rd grade, it was related to higher BMI at 5th grade, however this pattern was not observed for boys. We also found evidence that the detected associations are mediated by obesogenic behaviors – but with different behaviors for girls and boys. For girls, decreased relative physical activity levels at 5th grade and more screen time on weekends at 3rd grade mediated maternal depression-child BMI relations. For boys, unhealthy eating habits (measured at 5th grade) appeared to mediate the observed association.

Our most consistent pattern of results indicates that maternal depression impacts child BMI over time. Such effects seem to be different for girls and boys. Although the mechanisms to explain these differences are not apparent, they seem to mirror gender differences in development of major depression later in life by the offspring of depressed parents (2), with a steeper increase of prevalence in adolescence among girls compared to boys.

Our finding that maternal depression at K was related to lower BMI from K to 3rd grade among girls may reflect the end of a process which starts earlier in life (4;5), when mothers are almost exclusively responsible for children's obesity-related behaviors and maternal

depression has been shown to be related to feeding difficulties (25), and less healthy feeding practices (26). Most importantly, depressed mothers are likely disengaged from parenting (27), possibly leaving children to feed themselves. Without maternal involvement, younger children, may simply not be fed, while for older children, the capacity of getting food by themselves unsupervised in today's obesogenic environment, may result in weight gain. The fact that maternal depression at K was not related to lower weight among boys may indicate higher level of concern about boys being thin or smaller as compared to girls. Specific mechanisms underlying gender differences in potential mediators identified (physical activity for girls and eating behaviors for boys) are unclear, but could reflect gender-specific developmental processes and parent-child interaction patterns (28;29).

The analyses presented here should be considered in the context of study limitations. First, the assessment of maternal depression only occurred at two time points (no history of MDS information) and the measure employed was a shortened version of a widely used screening tool rather than a diagnostic measure. We focused on severe levels of depressive symptoms using this screening tool in order to ensure that clinically significant levels of depression are being considered. The testing of similar hypotheses using a diagnostic measure of major depressive disorder is warranted. Second, dietary assessment was limited to an abridged frequency checklist and the healthy eating score derived was necessarily crude. Third, incomplete participation at follow-up could have resulted in loss-to-follow-up bias if losses were related to mothers' mental health status. We did include nonresponse-adjusted weights to address this possibility. Fourth, unmeasured factors - such as parental BMI (30), postnatal/antenatal depression - could explain the results. Finally, despite the longitudinal design, in some instances the proposed mediator was measured at the same time point as child BMI.

To our knowledge, this is the first study to examine, nationally, the influence of maternal depression on school-aged child BMI over time. Our restriction to children who were of normal weight at birth limits the potential for our observations to be distorted by low birth weight. These findings, if confirmed, suggest that interventions on maternal depression may have a clinically relevant impact on childhood obesity during school years. If this is the case, maternal depression tackled at specific points in time, in addition to its other positive benefits to child well-being, would constitute a promising target for childhood obesity prevention.

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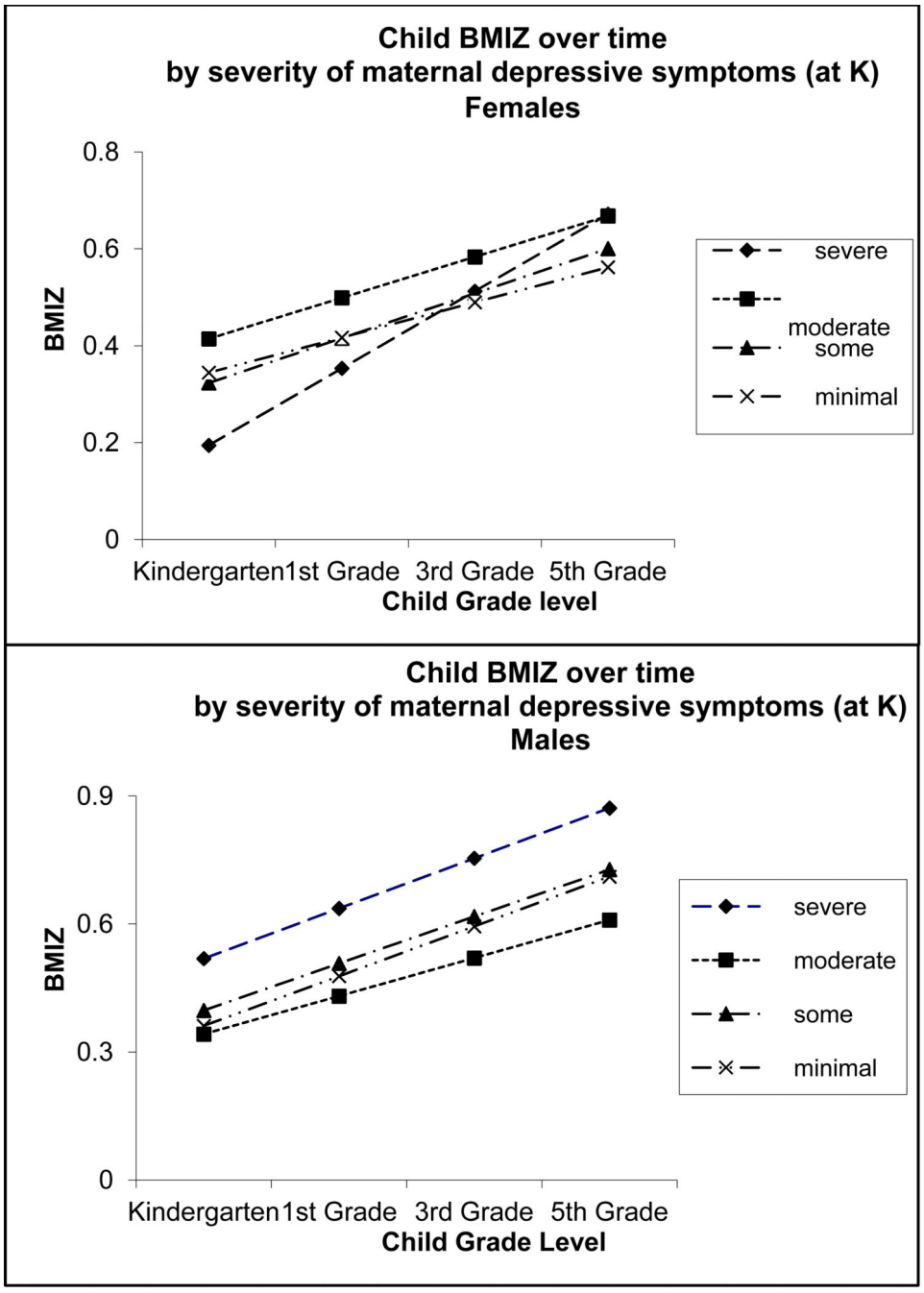


**Figure 1.**

**Table 1**

Descriptives for chld BMI z-score, maternal depression, demographics and obesity-related behaviors among school-aged boys and girls

| | Kindergarten | | | | | 3rd Grade | | | | | 5th Grade | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Boys | | Girls | | | Boys | | Girls | | | Boys | | Girls | | |
| **Variable** | **M/%** | **SE** | **M/%** | **SE** | **p** | **M/%** | **SE** | **M/%** | **SE** | **p** | **M/%** | **SE** | **M/%** | **SE** | **p** |
| BMIz (mean) | 0.42 | 0 | 0.38 | 0.03 | 0.25 | 0.65 | 0.03 | 0.56 | 0.03 | 0.03 | 0.77 | 0.03 | 0.64 | 0.03 | <0.01 |
| Maternal Depression (%) | | | | | | | | | | | | | | | |
| absent/minimal | 50.59 | 1.5 | 50.68 | 1.36 | 0.96 | 59.88 | 1.51 | 60.74 | 1.45 | 0.65 | | | | | |
| some symptoms | 30.11 | 1.2 | 27.95 | 1.33 | 0.23 | 23.66 | 1.26 | 24.04 | 1.34 | 0.83 | | | | | |
| moderate | 10.85 | 0.8 | 12.27 | 1.01 | 0.27 | 8.8 | 0.88 | 7.4 | 0.77 | 0.23 | | | | | |
| severe | 8.45 | 0.9 | 9.09 | 1.1 | 0.61 | 7.66 | 0.75 | 7.82 | 0.72 | 0.87 | | | | | |
| Race/Ethnicity (%) | | | | | | | | | | | | | | | |
| White | 57.11 | 2.1 | 55.09 | 2.18 | 0.31 | | | | | | | | | | |
| Black | 15.42 | 2 | 16.54 | 2.26 | 0.54 | | | | | | | | | | |
| Hispanics | 19.74 | 1.7 | 20.47 | 1.8 | 0.60 | | | | | | | | | | |
| Others | 7.73 | 1.3 | 7.91 | 1.17 | 0.83 | | | | | | | | | | |
| SES (mean) | 2.86 | 0.1 | 2.91 | 0.06 | 0.39 | | | | | | | | | | |
| Age (mean # months) | 74.84 | 0.2 | 74.45 | 0.13 | 0.03 | | | | | | | | | | |
| **Obesity-Related Behaviors** | | | | | | | | | | | | | | | |
| Physical Activity (%) | | | | | | | | | | | | | | | |
| Less than peers | | | | | | 7.42 | 0.68 | 7.56 | 0.75 | 0.90 | 11.11 | 0.82 | 11.12 | 0.89 | >0.99 |
| About the same | | | | | | 66.01 | 1.31 | 66.93 | 1.32 | 0.64 | 66.09 | 1.23 | 65.63 | 1.37 | 0.80 |
| More than peers | | | | | | 26.57 | 1.12 | 25.51 | 1.22 | 0.54 | 22.8 | 1.16 | 23.24 | 1.14 | 0.77 |
| Weekday screen time (mean # hours) | | | | | | 1.83 | 0.04 | 1.84 | 0.04 | 0.77 | 2.05 | 0.04 | 2 | 0.04 | 0.23 |
| Weekend screen time (mean # hours) | | | | | | 2.57 | 0.05 | 2.5 | 0.05 | 0.33 | 2.73 | 0.05 | 2.67 | 0.05 | 0.39 |
| Healthy Eating Habits (mean score) | | | | | | | | | | | 0.85 | 0.03 | 0.86 | 0.03 | 0.60 |

Means and percentages are weighted. Normal birth weight children only.

BMIz mean values and (SE) at First Grade: 0.42(0.03) among boys and 0.40 (0.03) for girls; p=0.5415

SES: socioeconomic status according to ECLS-K proposed score

Screen Time includes watching television or video tapes

Healthy Eating Habits is a composite score summarizing frequency of consumption of healthy (green salad, carrots, other vegetables and fruites) and unhealthy food items (fast food and caloric drinks)

## Table 2

Child BMI z-score by maternal depression among school-aged boys and girl

| | **Maternal Depression at K** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Boys** | | | | | **Girls** | | | | |
| | **absent/minimal** | **some symptoms** | **Moderate** | **Severe** | **p** | **absent/minimal** | **some symptoms** | **Moderate** | **Severe** | **p** |
| | **(N=2443)** | **(N=1222)** | **(N=418)** | **(N=249)** | | **(N=2421)** | **(N=1171)** | **(N=405)** | **(N=213)** | |
| BMIz K (mean) | 0.40 | 0.43 | 0.45 | 0.52 | 0.73 | 0.45 | 0.30 | 0.49 | 0.13 | <0.01 |
| BMIz First Grade (mean) | 0.38 | 0.45 | 0.36 | 0.60 | 0.17 | 0.43 | 0.38 | 0.46 | 0.16 | 0.08 |
| BMIz Third Grade (mean) | 0.64 | 0.67 | 0.58 | 0.74 | 0.57 | 0.57 | 0.54 | 0.67 | 0.41 | 0.25 |
| BMIz Fifth Grade (mean) | 0.75 | 0.76 | 0.73 | 1.04 | 0.03 | 0.65 | 0.57 | 0.72 | 0.65 | 0.56 |
| | **Maternal Depression at 3rd Grade** | | | | | | | | | |
| | absent/minimal | some symptoms | Moderate | Severe | p | absent/minimal | some symptoms | Moderate | Severe | p |
| | (N=2763) | (N=924) | (N=304) | (N=244) | | (N=2676) | (N=938) | (N=269) | (N=226) | |
| BMIz K (mean) | 0.41 | 0.34 | 0.46 | 0.59 | 0.06 | 0.35 | 0.42 | 0.40 | 0.46 | 0.56 |
| BMIz First Grade (mean) | 0.44 | 0.31 | 0.43 | 0.51 | 0.28 | 0.38 | 0.41 | 0.41 | 0.46 | 0.85 |
| BMIz Third Grade (mean) | 0.65 | 0.61 | 0.66 | 0.65 | 0.94 | 0.53 | 0.57 | 0.70 | 0.61 | 0.41 |
| BMIz Fifth Grade (mean) | 0.75 | 0.71 | 0.83 | 0.94 | 0.14 | 0.54 | 0.71 | 0.82 | 0.89 | <0.01 |

Means and percentages are weighted. Ns are for Kindergarten. Normal birth weight children only.

p values for linear trend

**Table 3**

Severe maternal depression and child BMI z-score at specific time points and over time by gender

| Independent variable(s)* | Dependent variable | | Girls | | | Boys | | |
|---|---|---|---|---|---|---|---|---|
| | | | Est | SE | p | Est | SE | p |
| Severe Mat Depression at K | | | | | | | | |
| | Child BMIz at 3rd | | −0.27 | 0.11 | **0.01** | 0.06 | 0.12 | 0.59 |
| | Child BMIz at 5th | | −0.15 | 0.11 | 0.16 | 0.24 | 0.11 | **0.03** |
| | Child BMIz K-5th | | | | | | | |
| | | main effect | −0.25 | 0.07 | **<0.01** | 0.10 | 0.07 | 0.14 |
| | | interaction with time | 0.09 | 0.0137 | **<0.01** | 0.00 | 0.01 | 0.95 |
| Severe Mat Depression at 3rd | | | | | | | | |
| | Child BMIz at 5th | | 0.22 | 0.11 | **0.05** | 0.05 | 0.10 | 0.57 |

*All models adjusted by race/ethnicity, SES and child age in months.

Reference group for severe maternal depression is none/minimal

Normal birth weight children only

**Table 4**

Mediating role of child obesity-related behaviors (ORB) on the prospective association between maternal depression and child BMIz

| | | | PA (less than vs. about the same) | | | | | | TV watching Weekdays | | | | | | TV watching Weekends | | | | | | Healthy Eating | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 3rd | | | 5th | | | 3rd | | | 5th | | | 3rd | | | 5th | | | 5th | | |
| | **Independent variable(s)*** | **Dependent variable** | **Est** | **SE** | **p** | **Est** | **SE** | **p** | **Est** | **SE** | **p** | **Est** | **SE** | **p** | **Est** | **SE** | **p** | **Est** | **SE** | **p** | **Est** | **SE** | **p** |
| | **Girls** | | | | | | | | | | | | | | | | | | | | | | |
| a | Severe Mat Depression at K | ORB | 0.87 | 0.45 | 0.06 | 0.79 | 0.40 | 0.05 | 0.17 | 0.13 | 0.19 | 0.32 | 0.21 | 0.12 | 0.46 | 0.21 | 0.026 | 0.23 | 0.226 | 0.31 | −0.14 | 0.10 | 0.17 |
| b' | ORB† | Child BMIz K-5th‡ | 0.53 | 0.06 | <0.01 | 0.56 | 0.05 | <0.01 | 0.026 | 0.02 | 0.10 | 0.05 | 0.02 | <0.01 | 0.05 | 0.012 | <0.01 | 0.03 | 0.01 | 0.01 | 0.02 | 0.01 | 0.23 |
| c' | Severe Mat Depression at K† | Child BMIz K-5th‡ | 0.09 | 0.01 | <0.01 | 0.09 | 0.01 | <0.01 | 0.08 | 0.02 | <0.01 | 0.11 | 0.02 | <0.01 | 0.08 | 0.02 | <0.01 | 0.01 | 0.02 | <0.01 | 0.09 | 0.01 | <0.01 |
| | *Sobel Test* | | | | | *0.44* | *0.07* | <0.01 | | | | | | | 0.02 | 0.02 | 0.16 | | | | | | |
| a | Severe Mat Depression at 3rd | ORB | 0.06 | 0.14 | 0.64 | 0.34 | 0.38 | 0.38 | 0.39 | 0.15 | 0.01 | 0.26 | 0.18 | 0.16 | 0.35 | 0.21 | 0.10 | 0.28 | 0.25 | 0.27 | 0.06 | 0.14 | 0.64 |
| b' | ORB | Child BMIz at 5th | 0.53 | 0.10 | <0.01 | 0.63 | 0.09 | <0.01 | 0.03 | 0.04 | 0.41 | 0.05 | 0.03 | 0.11 | 0.05 | 0.03 | 0.06 | 0.03 | 0.04 | 0.48 | 0.01 | 0.03 | 0.74 |
| c' | Severe Mat Depression at 3rd | Child BMIz at 5th | 0.22 | 0.11 | 0.04 | 0.21 | 0.11 | 0.05 | 0.17 | 0.13 | 0.19 | 0.21 | 0.13 | 0.11 | 0.13 | 0.13 | 0.32 | 0.15 | 0.13 | 0.26 | 0.22 | 0.11 | 0.05 |
| | **Boys** | | | | | | | | | | | | | | | | | | | | | | |
| a | Severe Mat Depression at K† | ORB | 0.15 | 0.35 | 0.66 | 0.37 | 0.13 | 0.26 | 0.19 | 0.14 | 0.16 | 0.10 | 0.19 | 0.58 | 0.29 | 0.19 | 0.13 | 0.06 | 0.20 | 0.76 | −0.25 | 0.12 | 0.04 |
| b' | ORB† | Child BMIz at 5th | 0.44 | 0.10 | <0.01 | 0.35 | 0.11 | <0.01 | 0.12 | 0.03 | <0.01 | 0.09 | 0.03 | <0.01 | 0.07 | 0.02 | <0.01 | 0.05 | 0.02 | 0.02 | 0.08 | 0.02 | <0.01 |
| c' | Severe Mat Depression at K† | Child BMIz at 5th | 0.22 | 0.11 | 0.05 | 0.25 | 0.11 | 0.02 | 0.27 | 0.10 | 0.01 | 0.28 | 0.12 | 0.02 | 0.18 | 0.12 | 0.14 | 0.32 | 0.12 | 0.01 | 0.26 | 0.11 | 0.02 |
| | *Sobel Test* | | | | | | | | | | | | | | | | | | | | −0.02 | 0.01 | <0.01 |

*all models adjusted by race/ethnicity (model includes all maternal depression and ORB as independent variables), SES and child age in months. Reference group for severe maternal depression is none/minimal level of symptoms

†model includes maternal depression and ORB

‡Estimates reported for longitudinal models (K-5th) are of maternal depression interacting with time

Normal birth weight children only