Association of Maternal Obesity and Depressive Symptoms With Television-Viewing Time in Low-Income Preschool Children

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Background: Decreasing television (TV)-viewing time may improve child health and well-being. These viewing patterns are shaped during the preschool years. Because mothers play an important role in determining how much TV their preschool children watch, a better understanding is needed of the maternal factors that influence children's TV viewing.

Objective: To examine the relationship of depressive symptoms and obesity in low-income mothers with TV-viewing time in their preschool children.

Methods: Cross-sectional, self-administered survey of 295 low-income mothers of 3- and 4-year-old children (92% white) enrolled in the Vermont Special Supplemental Nutrition Program for Women, Infants, and Children. Mothers reported children's usual weekday and weekend-day TV-viewing time. Maternal depressive symptoms were measured with the Center for Epidemiologic Studies Depression Scale (CES-D). Maternal body mass index was calculated from self-reported height and weight measurements (weight in kilograms divided by height in meters squared).

Results: Children watched a mean of 2.2 ±1.2 hours of TV per day. Those in the upper quartile of TV-viewing time (high TV viewers) watched 3 or more hours of TV per day. Of the mothers, 12% had both obesity (BMI ≥30) and depressive symptoms (CES-D score ≥16), 19% were obese only, and 18% had depressive symptoms only. Children were more likely to be high TV viewers if their mothers had clinically significant depressive symptoms (35% vs 23%; P=.03) or if their mothers were obese (35% vs 22%; P=.03). Forty-two percent of children were high TV viewers if the mother had both depressive symptoms and obesity, 30% if the mother had only depressive symptoms, 29% if the mother had only obesity, and 20% if the mother had neither depressive symptoms nor obesity (P=.06 overall; P for trend=.009 using the χ² test).

Conclusions: Among low-income preschool children, those whose mothers had either depressive symptoms or obesity were more likely to watch 3 or more hours of TV a day. Strategies to reduce TV viewing in young children should consider the role that maternal obesity and depressive symptoms may play in how preschool children spend their time.

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pression, maternal obesity, and children's TV viewing, we considered maternal level of education and smoking status as important covariates to evaluate. Maternal level of education has been associated with maternal depression, maternal obesity, and children's TV viewing. Maternal smoking is also strongly related to maternal depressive symptoms and maternal obesity.

Among low-income preschool children, we examined the hypotheses that hours of TV viewing would be greater in those whose mothers had either clinically significant depressive symptoms or obesity and would be greatest in mothers who had both. We tested these hypotheses in low-income families because obesity, depressive symptoms, and TV viewing are more common in low-income women.

**RESEARCH DESIGN AND SETTING**

We conducted a cross-sectional, self-administered survey of 295 low-income mothers of 3- and 4-year-old children enrolled in the Vermont Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). This is a federal program that provides supplemental food and nutrition counseling to low-income mothers and their children from birth through age 4 years. To be eligible for WIC, the family income must be at or lower than 185% of the federal poverty level.

**SAMPLE AND QUESTIONNAIRE ADMINISTRATION**

Our survey was administered to mothers of 3- and 4-year-old children at 4 Vermont WIC clinics (2 urban and 2 rural) as part of a baseline assessment for a controlled trial. The aim of the trial was to examine the effectiveness of an intervention to promote physical activity in these children. To be eligible for participation, mothers were required to be English speaking, to have a working telephone, and to have a child who was free of any chronic health condition that clearly affected physical activity (e.g., cerebral palsy). From January 2001 through November 2001, recruitment occurred in separate 8-week blocks at each of the 4 clinics. During each recruitment block, we attempted to enroll all eligible mothers bringing their children to that clinic for their biannual WIC recertification visit. Of the 360 mothers identified as eligible, 65 (18%) refused to participate. The most common reason for refusal was lack of time at that visit to complete the baseline questionnaire. This study was approved by the Committee on Human Research in the Behavioral Sciences at the University of Vermont (Burlington) and by the Vermont Department of Health. Each mother provided written informed consent before participation.

**MAIN OUTCOME MEASURE**

A child's daily TV-viewing time was obtained from the maternal response to 2 questions on the survey that were adapted from those used in the National Longitudinal Survey of Youth. The 2 questions on our survey were as follows: (1) “Think for a moment about a typical weekday for your family in the last month. How much time would you say your child spends watching television on a typical weekday?” (2) “Now think about a typical weekend day for your family in the last month. How much time would you say your child spends watching television on a typical weekend day?” Mothers were asked to record their responses in hours and minutes.

**PREDICTOR MEASURES**

The Center for Epidemiologic Studies Depression Scale (CES-D) was used to measure depressive symptoms among the mothers. The reliability and validity of this scale for detecting depressive symptoms has been established in previous studies. The scale produces possible scores from 0 to 60 based on responses to 20 self-administered items. A higher score indicates more depressive symptoms, and a score of 16 or higher is commonly used as the cutoff point for defining clinically significant depressive symptoms. Because the CES-D is a screening tool, it cannot be used to make a definitive diagnosis of depression. However, to make our results easier to report and understand, we have chosen to refer to mothers with a score of 16 or higher as depressed or having depression.

Maternal body mass index (BMI) was calculated from self-reported height and weight measurements (weight in kilograms divided by height in meters squared). Pregnant mothers were asked to report their prepregnancy weight, and these values were used to calculate the BMI. Obesity was defined as a BMI of 30 or higher.

**ADDITIONAL VARIABLES**

At the end of the maternal questionnaire, there were self-report items for sociodemographic variables such as maternal age, level of education, marital status, pregnancy status, and smoking status. The mother also reported the child’s date of birth and race and was asked if she had delivered a child within the past 12 weeks.

**DATA ANALYSIS**

The main outcome measure, TV-viewing time, was analyzed as both a continuous (in minutes) and dichotomous variable (upper quartile vs lower quartiles). To enhance the clinical relevance and interpretation of our findings, maternal BMI values and maternal CES-D score were treated as dichotomous variables (maternal obesity, BMI > 30; maternal depression, CES-D score ≥ 16) in the analyses. Children were placed into 1 of the following 4 groups based on the obesity and depression status of their mothers: neither obese nor depressed, obese but not depressed, depressed but not obese, or both obese and depressed.

Bivariate analyses were first conducted to evaluate the relationship between TV-viewing time and the other study variables. Only variables significantly related to TV-viewing time were considered to potentially confound the relationship between this outcome measure and either maternal depression or maternal obesity. We used multivariate linear regression with TV-viewing time (in minutes) as the dependent variable to control for confounding and explore possible interactions among study variables. To assess interactions in each model, we included the main effects and assessed the statistical significance (P < .05) of the interaction term. The following interaction terms were evaluated: maternal depression × maternal obesity, maternal depression × child sex, maternal obesity × child sex, maternal depression × maternal level of education, and maternal obesity × maternal level of education.

We used analysis of variance to compare the mean children’s TV-viewing times across the 4 groups defined by maternal obesity and depression status (with and without covariate adjustments), and we used the Newman-Keuls test for pairwise comparison of group means. Finally, using the χ² statistic, the proportion of children in the upper quartile of TV viewing was compared with that of children in the remaining 3 quartiles according to maternal depression and obesity status.
The questionnaire was completed by 295 mothers, 276 (94%) of whom were the biological mother. The mean ± SD age of the children was 46 ± 8 months, 92% were white, and 35% were boys. Forty-four percent attended 1 of the 2 rural WIC clinics, and 48% of the children spent some part of their week in day care.

The mean ± SD age of the mothers was 30 ± 6 years. The education levels of the mothers were as follows: 10% had completed less than high school, 43% had completed high school only, 36% had completed some college or a technical school, and 11% had at least a college degree. Sixty-one percent of mothers were married, 37% reported more than 2 children living in the home, and 7% had delivered a child within the past 12 weeks.

Thirty percent of the mothers were obese, and 31% were depressed. Children watched approximately the same amount of TV on weekend days and weekdays; therefore, a summary measure of mean daily TV-viewing time was computed as the average of each child's weekend and weekday TV-viewing hours (Table 1). This summary measure was used in all subsequent analyses.

Bivariate analyses revealed that children watched more TV if their mothers were obese or depressed (Table 2). Several variables showed no significant relationship to TV-viewing time. These included marital status, maternal smoking status, and child sex (Table 2) in addition to day care attendance, recent delivery of a child, and number of children in the household (data not shown). However, maternal level of education was related to children's TV viewing (Table 2). Therefore, we controlled for this variable in our subsequent analyses.

In multivariate regression analyses with TV-viewing time (in minutes) as the dependent variable, none of the interaction terms evaluated were statistically significant. After adjusting for maternal level of education, children whose mothers were depressed watched 23 more minutes of TV per day than children whose mothers were not depressed (95% confidence interval, 4-42 minutes), and children whose mothers were obese watched 26 more minutes of TV than those whose mothers were not obese (95% confidence interval, 8-45 minutes).

Finally, we evaluated children's TV-viewing time according to 4 distinct groups based on the obesity and depression status of their mothers (Table 3). Children of mothers who were both obese and depressed watched an additional 50 minutes of TV per day compared with children of mothers who were neither obese nor depressed (Table 3). The children of mothers who were either obese or depressed, but not both, watched an intermediate amount of TV. These same findings persisted after controlling for maternal education level. Forty-two percent of children whose mothers were both obese and depressed watched 3 or more hours of TV per day (upper quartile of TV viewing) compared with only 20% of those whose mothers were neither obese nor depressed.

Among 3- and 4-year-old children enrolled in the Vermont WIC Program, we found greater TV viewing in those whose mothers had either depressive symptoms or obesity and the greatest TV viewing in children whose mothers were both depressed and obese. In its Guidelines for Health Supervision III,29 the American Academy of Pediatrics recommends that those providing health care to children counsel parents about their child's TV viewing. However, most research on TV viewing in children has focused on the consequences of its excess rather than on identifying its behavioral determinants.

In our study of primarily white low-income families, maternal depressive symptoms were positively associated with hours of TV viewing in 3- and 4-year-old children even after controlling for maternal level of education. However, in a nationally representative sample of children from birth to age 35 months, low levels of maternal education (but not maternal depressive symptoms) were associated with greater TV viewing in children.10 These 2 studies may have different findings because the children in our study were older and were typically living in families with lower incomes.

Although our study was limited to a predominantly white low-income population of low-income mothers and their preschool children, the amount of children's TV viewing30 and the prevalence of maternal depressive symptoms22 and maternal obesity18,31 were comparable with those found in studies of other low-income families. The WIC Program currently serves more than 7 million women and children in the United States, and almost half of all US children are enrolled in WIC at some point in their lives.32 Our findings have potential implications for the WIC Program given its extensive contact with low-income mothers and their children, the growing problem of obesity in the program,33,34 and the potential value in beginning obesity prevention efforts early in life.

There were limitations to each of our study measures. Maternal obesity was assessed by self-report rather than measured height and weight. However, self-report measures have been shown to provide valid classification of obesity status among adults.19,21 The CES-D is not meant to be a diagnostic tool but has been shown to perform well as a screening tool18 and such measures are likely to be used in an office setting to assess maternal depressive symptoms. Maternal report of children's TV viewing may produce slight overestimates of TV-viewing hours when compared with daily logs and di-
Although logs and direct observation may theoretically be more valid measures of TV-viewing time, obtaining these measures could influence TV-viewing behavior. An additional limitation of our TV-viewing questions was that they did not specifically ask about the time children spend viewing videotapes or playing video games. Mothers may or may not have included these activities in their estimates of TV-viewing time. Thus, possible variations in interpretation of the questions may have led to some misclassification of TV-viewing time. Nonetheless, we have no evidence that such misclassification was systematic. Finally, without data on maternal TV viewing, we were unable to determine whether maternal TV-viewing habits mediated the relationships we identified in our study.

We cannot determine from this cross-sectional study whether either maternal obesity or maternal depressive symptoms cause increased TV viewing in children and, if so, what other factors may mediate these relationships. However, our findings do suggest that trying to shape the TV-viewing patterns of young children will require attention to maternal well-being because mothers are the likely mediators of these behavioral changes. Maternal well-being may be a primary determinant of whether mothers can provide their preschool children with alternative activities to TV viewing.

### Table 2. Relationship of Predictor Variables to Mean TV-Viewing Time and Percentage of Children in Upper Quartile of TV-Viewing Time

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>No. of Participants*</th>
<th>TV-Viewing Time, Mean ± SD, min</th>
<th>P Value†</th>
<th>Percentage in Upper Quartile‡</th>
<th>P Value§</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal obesity status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obese (BMI &gt;30)</td>
<td>86</td>
<td>149 ± 83</td>
<td>.007</td>
<td>35</td>
<td>.03</td>
</tr>
<tr>
<td>Not obese</td>
<td>193</td>
<td>121 ± 67</td>
<td></td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Depression status</td>
<td></td>
<td></td>
<td>.02</td>
<td></td>
<td>.03</td>
</tr>
<tr>
<td>Depressed (CES-D score ≥16)</td>
<td>86</td>
<td>150 ± 92</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not depressed</td>
<td>199</td>
<td>123 ± 65</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal education level</td>
<td></td>
<td></td>
<td>.03</td>
<td></td>
<td>.10</td>
</tr>
<tr>
<td>&lt;High school</td>
<td>27</td>
<td>160 ± 87</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school</td>
<td>121</td>
<td>136 ± 71</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some college or a technical school</td>
<td>106</td>
<td>127 ± 75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>College degree</td>
<td>33</td>
<td>105 ± 68</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td>.36</td>
<td></td>
<td>.48</td>
</tr>
<tr>
<td>Married</td>
<td>178</td>
<td>135 ± 72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not married</td>
<td>111</td>
<td>127 ± 78</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking status</td>
<td></td>
<td></td>
<td>.67</td>
<td></td>
<td>.38</td>
</tr>
<tr>
<td>Smoker</td>
<td>87</td>
<td>128 ± 73</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonsmoker</td>
<td>204</td>
<td>132 ± 75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child's sex</td>
<td></td>
<td></td>
<td>.14</td>
<td></td>
<td>.66</td>
</tr>
<tr>
<td>M</td>
<td>160</td>
<td>137 ± 79</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>131</td>
<td>124 ± 69</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); CES-D, Center for Epidemiologic Studies Depression Scale; TV, television.

*Where numbers of participants do not total 295, there were missing responses on the survey.
†Comparisons made using t test and analysis of variance.
‡Children in the upper quartile of TV-viewing time watched 3 or more hours of TV per day.
§Comparisons made using χ² test.

### Table 3. Children's TV-Viewing Time by Maternal Obesity and Depression Status

<table>
<thead>
<tr>
<th>Obesity/Depression Status*</th>
<th>Percentage of Participants</th>
<th>TV-Viewing Time, Unadjusted Mean ± SE, min</th>
<th>TV-Viewing Time, Adjusted Mean ± SE, min†</th>
<th>Percentage in Upper Quartile‡</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1: neither obese nor depressed (n = 140)</td>
<td>51</td>
<td>118 ± 5</td>
<td>121 ± 7</td>
<td>20</td>
</tr>
<tr>
<td>Group 2: obese, but not depressed (n = 52)</td>
<td>19</td>
<td>134 ± 10</td>
<td>138 ± 11</td>
<td>29</td>
</tr>
<tr>
<td>Group 3: depressed, but not obese (n = 50)</td>
<td>16</td>
<td>129 ± 12</td>
<td>131 ± 11</td>
<td>30</td>
</tr>
<tr>
<td>Group 4: obese and depressed (n = 31)</td>
<td>12</td>
<td>172 ± 17</td>
<td>170 ± 14</td>
<td>42</td>
</tr>
<tr>
<td>Overall P value</td>
<td>NA</td>
<td>.003†</td>
<td>.01‡</td>
<td>.06¶</td>
</tr>
</tbody>
</table>

Abbreviations: NA, not applicable; TV, television.
*Of the mothers, 22 had missing data for the Center for Epidemiologic Studies Depression Scale score, body mass index, or children's TV-viewing time.
†Adjusted for maternal education level.
‡Children in the upper quartile of TV-viewing time watched 3 or more hours of TV per day.
§The TV-viewing time in group 4 was greater than for groups 1 (P < .001), 2 (P = .02), and 3 (P = .01).
¶The TV-viewing time in group 4 was greater than for groups 1 (P = .001), 2 (P = .06), and 3 (P = .02).
| P for trend = .009 using a χ² test; P = .03 using a χ² test and comparing 3 groups (group 4 vs groups 2 and 3 vs group 1).
Studies have shown the adverse effects of excessive TV viewing on the health and well-being of young children. These viewing patterns are shaped during the preschool years when mothers have significant influence on how children spend their time. Therefore, we wanted to understand some of the maternal factors that influence children's TV viewing.

Studying a low-income population, we found that maternal obesity and depressive symptoms were related to high levels of TV viewing in preschool children. Health care professionals trying to limit TV viewing in preschoolers should consider the influence of maternal health and well-being on how children spend their time.

Many alternatives to TV viewing may also improve maternal well-being if the mother can engage her child in these activities. By joining young children in gross motor play and turning off the TV, mothers may be able to increase their own physical activity and receive some improvement in weight maintenance and mood. If children are able to engage in free play outdoors with parental supervision, it may lessen parental concerns about children's safety outdoors. According to observations from animal experiments, exposure to varied physical environments may increase cognitive stimulation for the child. In addition, being outside the home and in public spaces can promote social interaction for the mother and improve her own sense of well-being.

Television viewing is an attractive behavioral target because it is so prevalent, has been tied to the childhood obesity epidemic, and is associated with varied aspects of child well-being. Furthermore, there appears to be no danger to children in eliminating TV viewing altogether and no time in a child's life when it is too early to counsel parents about TV. However, providing parents with a realistic menu of alternative activities to TV requires an understanding of how and why TV has achieved its role within a particular family. For mothers to be successful mediators of such important family changes, we must pay attention to the well-being of mothers and to the current role TV plays in their own lives, in their parenting, and in the culture of the entire household. Early childhood could be an opportune developmental period for the primary prevention of excessive TV viewing, and understanding the family context in which TV viewing occurs will enlighten these prevention efforts.

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