



# Maternal Depression Trajectories and Children's Behavior at Age 5 Years

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**Objective** To assess the relationship between trajectories of maternal depression from pregnancy to the child's age of 5 years and children's emotional and behavioral difficulties at age 5 years.

**Study design** Mother-child pairs (n = 1183) from the EDEN mother-child birth cohort study based in France were followed from 24 to 28 weeks of pregnancy to the child's fifth birthday. Children's behavior at age 5 years was assessed with the Strengths and Difficulties Questionnaire. Maternal depression was assessed repeatedly with the Center for Epidemiological Studies Depression questionnaire (pregnancy, 3, and 5 years of age) and the Edinburgh Postnatal Depression Scale (4, 8, and 12 months postpartum). Homogeneous latent trajectory groups of maternal depression were identified within the study population and correlated with Strengths and Difficulties Questionnaire scores by the use of multivariate linear regression analyses.

**Results** Five trajectories of maternal symptoms of depression were identified: no symptoms (62.0%); persistent intermediate-level depressive symptoms (25.3%); persistent high depressive symptoms (4.6%); high symptoms in pregnancy only (3.6%); and high symptoms in the child's preschool period only (4.6%). Children whose mothers had persistent depressive symptoms—either intermediate or high—had the greatest levels of emotional and behavioral difficulties at age 5 years. In addition, compared with children whose mothers were never depressed, those whose mothers had high symptoms in the preschool period also had increased levels of emotional symptoms, conduct problems, and peer problems.

**Conclusions** Maternal depression symptoms are related to children's emotional and behavioral problems, particularly if they are persistent (29.9%) or occur during early childhood (4.6%). (*J Pediatr* 2015;166:1440-8).

Maternal depression consistently has been found to be detrimental to children's emotional and behavioral development throughout life.<sup>1,2</sup> Depressive episodes during pregnancy may affect fetal development, modifying the child's temperament, and increasing rates of attentional, emotional, and behavioral problems later on.<sup>3-6</sup> The first year of life is a "sensitive" period in terms of emotional regulation and attachment, and maternal depression in infancy also can hinder psychosocial development.<sup>7-9</sup> Similarly, during later periods of development maternal depression can have negative effects on the child's socialization and ability to establish satisfactory relationships with others, which increase the likelihood of both externalizing and internalizing problems.<sup>10-13</sup> Moreover, chronic maternal depression predicts children's behavior both in the short and long term.<sup>14-16</sup> It may therefore be that, rather than timing, the key feature of maternal depression with regard to children's behavior is the persistence of symptoms over time.<sup>14</sup>

However, research on the timing, chronicity, and severity of depressive symptoms in women with young children often has relied on cross-sectional data, which fails to fully capture the longitudinal trajectory of maternal symptoms of depression. Recently developed statistical methods make it possible to model data from studies of sufficient duration, separating out the course and severity of symptoms over time.<sup>17,18</sup> To date, only a limited number of studies have used such methodology to examine the role of maternal depression from infancy to late childhood in relation to children's behavior,<sup>19-23</sup> reporting that the chronicity of maternal depression is probably the key element with regard to children's development. Yet failure to account for maternal depression in pregnancy prevents firmly concluding that the timing of maternal depression is less relevant. To our knowledge,

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BIC	Bayesian information criteria
CES-D	Center for Epidemiological Studies Depression
EPDS	Edinburgh Postnatal Depression Scale
SDQ	Strengths and Difficulties Questionnaire

only Cents et al<sup>22</sup> followed mothers and children from mid-pregnancy onwards and found that the chronicity and severity rather than timing of maternal depression was associated with children's behavior at age 36 months. However, its association with children's behavior at older ages is not known.

The objective of this study was to examine the relationship between trajectories of maternal symptoms of depression—distinguishing a chronic course from depressive symptoms in particular developmental periods—from pregnancy to the child's fifth birthday and children's behavior by the use of data from the EDEN study, a longitudinal community-based cohort study conducted in France. Our analyses controlled for maternal, family, and child characteristics that can be associated with both maternal depression and children's outcomes.<sup>24</sup>

## Methods

Participants of the EDEN mother-child birth cohort study<sup>25</sup> were recruited between 2003 and 2006 among pregnant women (24 weeks of amenorrhea) followed in 2 maternity wards in Poitiers and Nancy University hospitals (France). Exclusion criteria were multiple pregnancies, a known history of diabetes, the inability to speak and read French, or plans to move out of the study region in the following 3 years. Among eligible women, 55.0% ( $n = 2002$ ) agreed to participate and birth data were obtained from 1899 mother-infant pairs. During pregnancy and after birth (4, 8, 12, 24 months and 3, 4, and 5 years of age), sociodemographic and biomedical data on mother and child were gathered from medical records, face-to-face interviews with the mother, and the mother's self-completed questionnaires. By the year 5 follow-up, data were available for 1183 (62.5%) participating mothers and children. Attrition was greatest in young mothers ( $P < .001$ ), those with low educational level ( $P < .001$ ), of non-French origin ( $P < .001$ ), who did not live with the father of their child ( $P = .002$ ), as well as those who were depressed during pregnancy ( $P < .001$ ) or in the postpartum period ( $P = .002$ ). Written consent was obtained from the mother for herself at inclusion and for her newborn child after delivery. The study was approved by the Ethics Committee of Kremlin Bicêtre hospital and by the French Data Protection Authority.

### Maternal Depressive Symptoms

Maternal symptoms of depression in pregnancy and at 3 and 5 years' follow-ups were assessed using the Center for Epidemiological Studies Depression (CES-D) questionnaire,<sup>26</sup> a 20-item questionnaire measuring the number of symptoms over the preceding week (range 0-60) with high reliability and validity.<sup>27</sup> Although not specifically designed to measure depression in pregnancy, the CES-D has been used previously in pregnant women.<sup>28,29</sup> The average Cronbach alpha across the 3 measurement moments was 0.88. Maternal symptoms of depression during the first

year after the child's birth (4, 8, and 12 months postpartum) were assessed using the Edinburgh Postnatal Depression Scale (EPDS), a 10-item questionnaire designed to detect postnatal depression (range 0-30).<sup>30</sup> Across the 3 measurement points, Cronbach alpha was 0.85.

To identify trajectories of maternal depressive symptoms, we needed to meaningfully combine the scores of both instruments, which have different possible symptom severity score ranges. Thus, the scores for each instrument were standardized to t-scores ( $M = 50$ ,  $SD = 10$ ), which allowed us to study them jointly as continuous measures.<sup>31</sup>

### Child Behavior

Children's behavior at age 5 years was ascertained by the mothers using the Strengths and Difficulties Questionnaire (SDQ),<sup>32</sup> a questionnaire designed to assess the behavior and emotions of 3- to 16-year-old children. The SDQ consists of 25 items that are divided into 5 subscales (range 0-10): emotional symptoms, conduct problems, symptoms of hyperactivity/inattention, peer relationship problems, and prosocial behavior. All subscales (except prosocial behavior) are summed to obtain a score of children's overall behavioral problems (range 0 to 40). The SDQ has good psychometric characteristics and is comparable with other measures such as the Child Behavioral Checklist.<sup>33</sup> In our sample, Cronbach alpha for overall behavioral problems was 0.79.

### Covariates

Covariates included in the multivariate analysis include maternal, family, and child characteristics ascertained at study baseline unless indicated otherwise. Maternal characteristics were maternal age at the child's birth, years of formal education, maternal anxiety in pregnancy (State-Trait Anxiety Inventory<sup>34</sup> score), history of mental health problems (no vs yes), maternal antidepressant use from pregnancy to the 5th-year assessment (no vs yes), maternal prenatal substance use (alcohol, smoking, illicit drugs; no vs yes), and any breastfeeding (duration in months). Family characteristics were study center (Poitiers vs Nancy), family situation from pregnancy to the 5th-year assessment (parents living together vs separated), any low family income from pregnancy to the 5th-year assessment (<1500 Euros/month, category closest to the bottom quartile; no vs yes), number of siblings living at home, child care arrangements from birth to the child's 3rd year (mother vs others), any domestic violence from pregnancy to the 5th-year assessment (no vs yes), social support (no vs yes), and paternal substance abuse (no vs yes). Child characteristics included: child's sex (male vs female), premature birth ( $\leq 37$  vs  $> 37$  weeks of gestation), and small for gestational age (no vs yes).

### Statistical Analyses

Our aim was to assess the association between trajectories of maternal symptoms of depression and children's behavior. First we calculated trajectories of maternal symptoms of depression using growth trajectory models (PROC TRAJ

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