Longitudinal Study of Maternal Depressive Symptoms and Child Well-Being

ILONA LUOMA, M.D., TUULA TAMMINEN, M.D., PH.D., PÄLVI KAUKONEN, M.D., PEKKA LAIPPALA, PH.D., KAIJA PUURA, M.D., PH.D., RAILI SALMELIN, PH.D., AND FREDRIK ALMQVIST, M.D., PH.D.

ABSTRACT

Objective: To investigate whether prenatal, postnatal, and/or current maternal depressive symptoms are associated with low level of psychosocial functioning or high level of emotional/behavioral problems in school-age children. **Method:** As part of a prospective longitudinal study, maternal depressive symptoms were screened with the Edinburgh Postnatal Depression Scale prenatally, postnatally, and when the children were 8 to 9 years old. The original sample of 349 mothers was collected in 1989–1990 in Tampere, Finland. Of the 270 mother–child pairs at the latest stage of the study in 1997–1998, 188 mother–child pairs participated and 147 were included. The associations between maternal depressive symptoms at different points in time and the level of children's psychosocial functioning and problems reported on the Child Behavior Checklist and Teacher's Report Form were examined. **Results:** Children's low social competence and low adaptive functioning were associated with concurrent maternal depressive symptoms. Maternal postnatal depressive symptoms predicted low social competence. The presence of prenatal depressive symptoms in the mother was a strong predictor of child's high externalizing and total problem levels (odds ratio 3.1, 95% confidence interval 1.1–8.9 and odds ratio 8.5, 95% confidence interval 2.7–26.5). Prenatal as well as recurrent maternal depressive symptoms were associated with the least favorable child outcome. **Conclusions:** Maternal depressive symptomatology at any time, especially prenatally, is a risk factor for the child's well-being. This should be noted already in prenatal care. The timing and the recurrence of maternal depressive symptoms affect the outcome for the child. *J. Am. Acad. Child Adolesc. Psychiatry*, 2001, 40(12):1367–1374. **Key Words:** maternal depression, postnatal depression, prenatal depression, Child Behavior Checklist, Edinburgh Postnatal Depression Scale.

There has been growing interest in both child and adult psychiatry concerning how and how early in the process of development the origins of psychopathology arise (Cicchetti, 1990). The intergenerational transmission of affective disorders has also gained attention in the literature regarding interaction (Campbell et al., 1995), genetics (Todd et al., 1993), impaired parenting (Warner et al., 1999), and attachment (Teti et al., 1995).

Depression is a disorder that profoundly affects a person's social and interpersonal functioning, and it is common among mothers with young children (Murray et al., 1995; Tamminen, 1990). The increased risk for psychopathology of depressed mothers' children is well documented, although the reports from studies concerning the depressed mothers' children are diverse and also show adaptive outcomes (for reviews see Beardslee et al., 1998; Cummings and Davies, 1994).

One factor probably contributing to diversity in the findings is the definition and quality of the mother's depression. In many studies there have been mothers with a clinical history of depression (Beardslee et al., 1998). Regarding the consequences of the mother's depression for a child and for the mother–child interaction, however, it is the mother's symptomatology that counts more than

Accepted June 21, 2001.

Dr. Luoma, Professor Tamminen, Dr. Kaukonen, and Dr. Puura are with the Department of Child Psychiatry, Tampere University Hospital and the University of Tampere, Finland; Professor Laippala and Dr. Salmelin are with the University of Tampere, School of Public Health and Research Unit, Tampere University Hospital; and Professor Almqvist is with the Department of Child Psychiatry, University of Helsinki.

The study was supported by grants from the Finnish Child Psychiatric Research Foundation, the Foundation of Paediatric Research, and the Medical Research Fund of Tampere University Hospital.

Reprint requests to Dr. Luoma, University of Tampere, Medical School, FIN-33014 University of Tampere, Finland; e-mail: ilona.luoma@uta.fi.

a diagnosis per se (Hammen et al., 1987). Women with diagnosed depression that is in remission may show normal interaction with their children, whereas women with no depression, if distressed, may display negative perceptions and negative interaction with their children (Conrad and Hammen, 1989). The frequency, duration, and timing of the parental depressive phenomena in relation to the child's developmental stages are also of significance (Cummings and Davies, 1994). The severity of the parental disorder does not always correlate directly with the negative nature of child outcome: Rutter (1990) suggested that more severe parental symptoms may support the child's understanding of a parent as "ill" and result in adjustment. Furthermore, severe parental disturbance is more likely to be noticed by others, and external support may be more easily forthcoming for the child.

The second factor contributing to the diversity in children's outcomes is the resiliency of the psychosocial developmental processes with many possible pathways to healthy adulthood (Rutter, 1989). Children have individual strengths and coping strategies which work differently at different developmental stages. A child may be resilient at one age period and vulnerable at another: for example, in a study conducted by Goodman et al. (1993), older children in middle childhood appeared to be more vulnerable than younger children to multiple risk factors associated with parental depression. There may also be a gender difference in vulnerability: boys are documented to be more affected by maternal depression than girls, at least in infancy and early childhood (Murray et al., 1996). It is also possible that boys and girls are in a different way vulnerable to the either intrusive or withdrawn styles of interaction associated with maternal depression (Tronick and Weinberg, 1997).

Third, the impact of the mother's depression on an individual child may be modified by a variety of environmental psychological and nonpsychological factors. Examples of cumulative risk factors often associated with maternal depression are marital dissatisfaction, paternal psychopathology, and socioeconomic disadvantage (Dierker et al., 1999; Murray et al., 1996).

There is abundant research documentation of mother's postnatal depression, early interaction, and infant cognitive and emotional development (e.g., Campbell et al., 1995; Murray et al., 1996; Tronick and Weinberg, 1997). Mother's depression is documented to have an effect on early child development from the perinatal period. Even the prenatal depression of the mother is argued to have both direct and indirect adverse effects on the fetus because of the mother's associated poor health behaviors and the possible physiological effects of depression, and also because of the mother's negative feelings toward the unborn child (Green and Murray, 1994). In the study by Kumar and Robson (1984), previous psychiatric disturbance was associated with prenatal but not with postnatal depression. Postnatal depression is also documented to differ from depression of women in other life stages regarding psychosocial background characteristics but not regarding symptoms (Murray et al., 1995).

There is still a lack of longitudinal research concerning the associations of postnatal depression with the child's functioning and psychopathology in later childhood. It is not known whether the reported consequences of postnatal depression for a child have long-term continuity or whether they are compensated along with the maternal recovery. There are still very few studies on the significance of the timing of maternal depression, given that there may be particularly vulnerable periods in child development. There is clearly a lack of research on the possible effects of maternal prenatal depression on the child's mental health.

The first aim of this study was to examine whether high levels of maternal prenatal, postnatal, or concurrent depressive symptoms are associated with a child's psychosocial functioning and emotional/behavioral problems when the child is of school age. The second aim was to study whether maternal prenatal and/or postnatal depressive symptoms are associated in the long term with an increased risk of low functioning or high problem levels in the child. The third aim was to study the associations between the timing and recurrence of the mother's depressive symptoms and the level of the child's psychosocial functioning and symptomatology.

METHOD

Study Design

This study is a part of a prospective follow-up study that started in Tampere, Finland, in 1989. The target group consisted of healthy first-time mothers. The sample was collected from all maternity health clinics in the city of Tampere during a 6-month period in 1989–1990. The depressive symptoms of the mothers were screened by means of questionnaires during late pregnancy (T_1) and three times postnatally (T_2 = during the first week, T_3 = 2 months and T_4 = 6 months after delivery). A subgroup of these mothers was screened for depressive symptoms at the second stage of the follow-up study in 1994–1995 (T_5, not included in this report). At the third stage of the follow-up study a postal survey was conducted during the period November 1997–April 1998 (T_6). The depressive symptoms of the mothers were screened, and the firstborn children's psychosocial

functioning and emotional/behavioral problems were assessed by questionnaires completed by parents and teachers.

Sample

The sample at each stage of the longitudinal study and the groups of dropouts are presented in Figure 1. The randomized sample of 349 mothers who agreed to participate in the study represented healthy Finnish first-time mothers. Less than 10% of the target population refused to participate. Seventy mothers were excluded at the first stage (T_1–T_4) (Tamminen, 1990) because they were screened outside the time schedule of the first study stage. This group of excluded mothers was included again at T_6. Of the 279 mothers selected for the first study stage, 78 dropped out of the study during the first 6 months after delivery. The largest group of dropouts between T_1 and T_2 (69 mothers) consisted of mothers who did not receive the questionnaires of the first postnatal (T_2) survey from the obstetrics ward during the summer vacations. The number of dropouts between T_2 and T_3 and also between T_3 and T_4 was small. These excluded and dropout groups at the perinatal stage did not differ significantly from the study sample by sociodemographic characteristics or by maternal prenatal level of depressive symptoms.

At the second stage of the follow-up study (T_5) during the period 1994–1995, questionnaires were sent to 200 mothers of the previous study stage. The questionnaires were answered by 79% of recipients.

At the third stage of the follow-up study (T_6), the questionnaires were sent to 270 mothers, i.e., the original sample except for the dropouts between T_1 and T_5. Three mothers and children were excluded: one mother could not be reached because of unknown address and two mothers had moved abroad. The questionnaires were returned by 188 mothers (70%) of 189 children (one set of twins). The dropouts consisted of 2 mothers and 1 child who had died, 13 mothers who refused to participate because they were too busy or because they considered the questionnaires too difficult, and 63 mothers who did not return questionnaires during the survey despite two reminders. The teachers' questionnaires were returned with mother's permission for 157 children.

The children and mothers for whom all the perinatal screening questionnaires (T_1–T_4) and the questionnaires from both mother and teacher at T_6 were available were selected for the present analysis, i.e., 147 mother–child pairs were included. The groups of dropouts were analyzed by using the information from previous stages of the study. They did not differ significantly from the sample of this study regarding mother's marital status, mother's education, socioeconomic status, or the occurrence of maternal depressive symptoms prenatally or postnatally. The characteristics of the sample (T_6) are shown in Table 1.

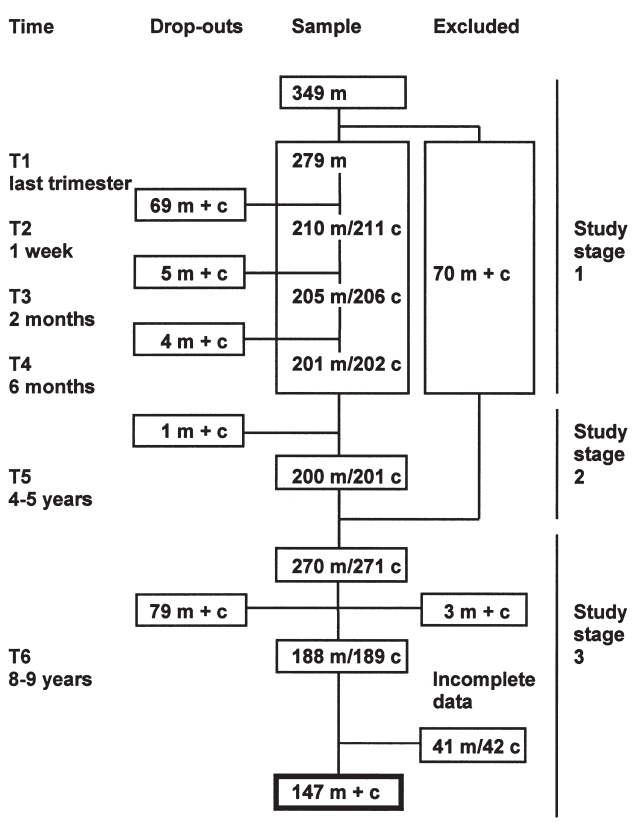

Fig. 1 The stages of the longitudinal study (m = mother, c = child).

Procedure

The depressive symptoms of the mothers at different time points were screened with the Edinburgh Postnatal Depression Scale (EPDS), a self-report questionnaire designed to detect depression among women in the postpartum period (Cox, 1994). It has been found also to have satisfactory validity among non-postnatal women (Cox et al., 1996). In the EPDS the mothers are asked to choose from the given options those that best describe their feelings during the previous week. The scale consists of 10 items scored on a 4-step scale from 0 to 3. The sum score of items ranges from 0 to 30. With a cut-point of ≥13, used in this study, a sensitivity of 86% and a specificity of 78% has been reported for postnatal depression (Cox, 1994). A sensitivity of 88% and a specificity of 80% have been reported for non-postnatal major depression (Cox et al., 1996). In this study the sensitivity was 64% and the specificity 96% for postnatal depression

TABLE 1
Characteristics of the Total Sample (n = 147)

	%	
Gender of the child		
Female	54	
Male	46	
Mother's marital status		
Marriage or cohabitation	90	
Single	10	
Mother's education		
Academic	16	
College	62	
Comprehensive school, vocational school	22	
SES of the family[a]		
Upper	47	
Lower	53	
No. of children in the family		
One	16	
Two	53	
Three or more	31	
Mother's age in years, mean (SD)	34.7	(4.1)
Child's age in years, mean (SD)	8.5	(0.3)

[a] Socioeconomic status (SES) of the family is determined by the occupation of the main breadwinner; for single mothers' families the SES of the family is determined by the occupation of the mother.

(Tamminen, 1990). The high cutpoint was used to distinguish the mothers with the most severe depressive symptoms.

The mothers completed the Child Behavior Checklist (CBCL) questionnaires (Achenbach, 1991a). The CBCL is an instrument designed to record children's competencies and problems as reported by their parents. The total Social Competence score as well as Internalizing, Externalizing, and Total Problem scores of the CBCL were used as child outcome variables. The Social Competence scale contains parents' reports concerning the child's activities (hobbies, tasks, chores), functioning in social relationships (with peers, siblings, and parents), and school achievements. The Total Competence score is the sum of scores from activities, social, and school scales. The CBCL problem scales include 118 items, each of which is scored on a three-step scale. The Total Problem score is a sum score of all the problem items. The Internalizing score is a sum score of problem items concerning withdrawal, somatic complaints, and depressed/anxious symptoms whereas the Externalizing score is a sum score of problem items concerning delinquent and aggressive behavior.

The Teacher's Report Forms (TRFs) (Achenbach, 1991b) were completed by the teachers. The TRF Adaptive Functioning score and also Internalizing, Externalizing, and Total Problem scores were used. The TRF Adaptive Functioning scale comprises teacher's ratings of the child's working, behaving, learning, and happiness. Each item is assessed on a scale from 1 to 7. The sum score of the items describes the child's overall adaptive functioning at school. The TRF Externalizing, Internalizing, and Total Problem scales correspond to those of the CBCL scales.

The raw scores of CBCL and TRF were converted into normalized *T* scores. This makes it possible to compare the Internalizing, Externalizing, and Total Problem scores obtained by CBCL and TRF (Achenbach, 1991a,b). The cutpoint of $T \geq 60$ was used for Internalizing, Externalizing, and Total Problem scores. The low-functioning group for both CBCL total Social Competence and TRF Adaptive Functioning was determined to consist of children whose scores were within the lowest 15th percentile.

Background information concerning the demographic data was gathered by questionnaires designed for this study phase.

Statistical Analysis

For examination of the continuity and discontinuity of maternal depressive symptoms, the mothers were first divided into those scoring below and those scoring above the cutpoint on the EPDS at each time point. Of the multiple postnatal assessments, the time point T_3 was selected for further analysis because of the known incidence peak of postnatal depression at 2 to 3 months (e.g., Kumar and Robson, 1984). Furthermore, the first biobehavioral shift in infant development takes place at 2 to 3 months (Zeanah et al., 1997), and this could be regarded as a sensitive time period for an infant. Second, the groups of mothers were categorized by the number of the points in time when they had scored high on the EPDS (never, once, twice or more).

For descriptive purposes cross-tabulations, together with Fisher exact test (two-tailed), were used to examine the categorized child outcome variables by maternal depressive status. Means and standard deviations were calculated for the continuous variables. Continuity issues of maternal depressive symptoms were examined by Spearman correlations.

The multivariate modeling method used was logistic regression. Child outcome variables acted as dependent variables. For these analyses the problem reports of the mothers and the teachers were combined. The children were regarded as problematic if they scored high either on mothers' or on teachers' problem scales or on both. Inasmuch as the CBCL Social Competence and the TRF Adaptive Functioning scales are different in content, they were not combined. Sociodemographic variables (mother's education and marital status, family socioeconomic status, number of children in the family) and child's gender, as presented in Table 1, were included in the models as independent variables. Mother's age (dichotomized with a cutpoint ≥35 years) and prenatal, postnatal (T_3), and concurrent assessments of depressive symptoms were also included. The results of regression analyses are presented as odds ratios (ORs) and their 95% confidence intervals (CIs). The data analysis was carried out with SPSS/WIN (version 9.0) software.

RESULTS

Maternal Depressive Symptoms

The proportion of the mothers scoring high in the EPDS was 11% at T_1, 9% at T_2, 9% at T_3, 10% at T_4, and 7% at T_6. Of the 16 mothers who scored high prenatally, only two scored high after delivery. Seven of the prenatally symptomatic mothers scored low at every subsequent time point. Only one mother was symptomatic at each of the five assessments and 101 mothers scored low at each time point. Thirty-two mothers scored high once, nine mothers twice, three mothers three times, and one mother four times. Six of the 11 mothers who scored high at T_6 had low symptom levels at previous assessments.

The correlation coefficients of the EPDS scores at different time points diminished over time (between T_3 and T_4 $r = 0.65$ and between T_1 and T_6 $r = 0.27$). Although some of the correlations between the depressive symptom levels at different time points were significant, the turnover of high scorers and low scorers was also high. Therefore, the term *recurrence* (and not persistence) of the depressive symptoms is preferred in further analyses for those mothers who scored high at two or more time points.

Child Functioning and Problem Levels

In the CBCL the mean Social Competence score of the children was 49.7 (SD 8.6) and the lowest 15th percentile was equivalent to a *T* score ≤40. In the TRF the mean Adaptive Functioning score was 52.3 (SD 7.5) and the lowest 15th percentile was equivalent to a *T* score ≤42. On the problem scales, the proportions of children scoring over the cutpoint in CBCL and TRF were 20% and 16% for Internalizing, 11% and 18% for Externalizing, and 18% and 10% for Total Problems, respectively. When the problem reports were combined, the proportions of children scoring high on either or both informants' scales were 34% for Internalizing, 27% for Externalizing, and 26% for Total Problems.

Maternal Concurrent Depressive Symptoms and Child Outcome

The associations of maternal depressive symptoms at different time points with child outcome are presented in Tables 2 and 3. The proportions of low-functioning or problematic children were in general larger among the children of mothers with concurrent depressive symptoms except for TRF Internalizing Problems. The differences between the groups were significant for low CBCL Social Competence, low TRF Adaptive Functioning, and high CBCL Total Problems.

Maternal Postnatal Depressive Symptoms and Child Outcome

Among the children of the mothers with depressive symptoms at T_3, the proportions of low-functioning or problematic children were also larger than among the children of mothers who were nonsymptomatic except for TRF Internalizing Problems. The difference between the groups of children was statistically significant for children's Total Problems according to mothers' reports (Tables 2 and 3).

Maternal Prenatal Depressive Symptoms and Child Outcome

A significantly larger proportion of children of prenatally symptomatic mothers scored high on CBCL Externalizing and Total Problems than did the nonsymptomatic group. According to the teachers' reports, the proportions of low-functioning and problematic children were also larger for the prenatally symptomatic mothers' group than for the prenatally nonsymptomatic group on each of the scales, but the differences were not statistically significant at the $p < .05$ level.

Maternal Depressive Symptomatology at Different Time Points as a Predictor of Child Outcome

In the logistic regression analyses, maternal prenatal high level of depressive symptoms remained the only variable predicting child's high Externalizing Problems (OR 3.1, 95% CI 1.1–8.9) and Total Problems (OR 8.5, 95% CI 2.7–26.5) in the models with mothers' and teachers' problem reports combined. A child's low social competence according to the mother was predicted by the presence of maternal postnatal depressive symptoms at T_3 (OR 7.6, 95% CI 1.6–36.6) together with male gender of the child (OR 3.7, 95% CI 1.1–11.9), single parenthood (OR 5.0, 95% CI 1.2–20.6), and maternal age 35 or older (OR 5.5, 95% CI 1.5–20.4). A child's low adaptive functioning according to the teachers was predicted only by the mother's concurrent depressive symptoms (OR 5.2, 95% CI 1.1–23.8). A child's high internalizing problems were predicted only by single parenthood (OR 3.3, 95% CI 1.1–10.0) and not by maternal depressive symptoms at any time point included.

Recurrence of Maternal Depressive Symptoms and Child Outcome

The associations between the recurrence of maternal depressive symptoms and children's functioning and problems are shown in Tables 4 and 5. On both of the functioning scales and on half of the separate problem scales, the proportion of low-functioning or problematic children was largest if the mother had been symptomatic at two or more time points. The exceptions of the problem scales were the Internalizing scale according to both mothers' and teachers' reports and the Externalizing scale according to the mothers. According to the mothers' reports child

TABLE 2
Proportions (%) of Children Having a Low Level of Functioning by Groups of Mothers With (D) and Without (ND) Depressive Symptoms at Different Time Points

	Prenatal		Postnatal (T_3)		Current	
	ND	D	ND	D	ND	D
Social Competence[a]	(n = 123)	(n = 15)	(n = 126)	(n = 12)	(n = 128)	(n = 10)
CBCL	11	27	11	33†	11	40*
Adaptive Functioning[b]	(n = 122)	(n = 13)	(n = 124)	(n = 11)	(n = 126)	(n = 9)
TRF	9	23	9	27†	9	33†

Note: The number of children varies because of missing data. CBCL = Child Behavior Checklist; TRF = Teacher's Report Form.

[a] n = 138.

[b] n = 135.

† $p < 0.1$; * $p < .05$.

TABLE 3
Proportions (%) of Children Having a High Level of Problems by Groups of Mothers With (D) and Without (ND) Depressive Symptoms at Different Time Points (n = 147)

	Prenatal		Postnatal (T_3)		Current	
	ND (n = 131)	D (n = 16)	ND (n = 134)	D (n = 13)	ND (n = 136)	D (n = 11)
Total Problems						
CBCL	13	56***	16	39†	15	45*
TRF	8	19	9	15	9	18
Internalizing						
CBCL	18	31	18	39	19	27
TRF	15	19	16	8	16	9
Externalizing						
CBCL	8	38***	10	15	10	27
TRF	17	25	16	31	17	27

Note: CBCL = Child Behavior Checklist; TRF = Teacher's Report Form.
† $p < .1$; * $p < .05$; *** $p < .005$.

outcome was generally most favorable if the mother had not scored high on the EPDS in any of the assessments. According to the teachers' reports the proportions of low-functioning or problematic children on all scales were lowest if the mother had scored high at one time point.

DISCUSSION

In this study, the follow-up time of the mothers and the children was extensive compared with previous studies on maternal depressive symptoms in relation to child psychosocial development. The sample was population-based and remained moderate in size and representative during follow-up. On the basis of the information available from the previous stages of follow-up, the attrition did not distort the findings.

TABLE 4
Proportions (%) of Children Scoring Low on Functioning Scales by Recurrence of Maternal Depressive Symptoms

	EPDS Score		
	Always <13	Once ≥13	At Least Twice ≥13
Social Competence[a]	(n = 95)	(n = 31)	(n = 12)
CBCL	7	23	33
Adaptive Functioning[b]	(n = 96)	(n = 27)	(n = 12)
TRF	10	4	25

Note: The number of children varies because of missing data. EPDS = Edinburgh Postnatal Depression Scale; CBCL = Child Behavior Checklist; TRF = Teacher's Report Form.
[a] n = 138.
[b] n = 135.

The first unexpected finding in this study was the diversity and continuing changes in maternal depressive symptom levels over time. The timing of maternal depressed mood is probably also one of the factors causing variability in child outcome. The instability of depressive symptoms merits more attention in future prospective studies.

The lack of association between maternal depressive symptoms and internalizing problems of the children was also unexpected. This finding could be associated with the fact that the assessments of the children's symptoms presented in this report were made by the mothers and the teachers, not by the children themselves or by clinicians. It has been noted (e.g., Puura, 1998) that parents report fewer internalizing symptoms, such as symptoms of

TABLE 5
Proportions (%) of Children (n = 147) Scoring High on Problem Scales by Recurrence of Maternal Depressive Symptoms

	EPDS Score		
	Always <13 (n = 101)	Once ≥13 (n = 32)	At Least Twice ≥13 (n = 14)
Total Problems			
CBCL	12	28	36
TRF	10	6	14
Internalizing			
CBCL	16	31	21
TRF	18	9	14
Externalizing			
CBCL	8	19	14
TRF	19	9	29

Note: EPDS = Edinburgh Postnatal Depression Scale; CBCL = Child Behavior Checklist; TRF = Teacher's Report Form.

depression, in their children than do the children themselves. Tronick and Weinberg (1997) also suggested that children of depressed mothers may develop an angry and hostile coping mechanism when relating to other people, particularly if the interactive style of the mother has been intrusive. On the whole, depressive symptomatology of both mothers and children is heterogeneous: irritability, agitation, and aggression may be manifested as symptoms of depression (Cummings and Davies, 1994; Rutter, 1990). The association between child's externalizing problems and maternal depressive symptoms has been noted in previous studies and could be due to less sensitive parenting by depressed mothers, leading to the child's aggression and acting out (Cummings and Davies, 1994).

The finding that the concurrently symptomatic mothers reported more problems and lower competence in their children than the nonsymptomatic mothers concurs with previous studies (e.g., Chilcoat and Breslau, 1997; Conrad and Hammen, 1989). It can be argued that at least some of the differences between the symptomatic and nonsymptomatic mothers' problem reports is due to the negativity of the perceptions associated with maternal depression, because according to teachers' problem reports the difference between symptomatic and nonsymptomatic mothers' children was smaller. On the other hand, the perceptions of the teachers are limited to the school context. Mothers' depressive symptoms may evoke and maintain negative interactional patterns between the mother and the child limited only to this interaction.

In light of these results, the impact of maternal postnatal depressive symptoms on child's emotional/behavioral problems in the long term was slight. This suggests that the previously documented negative impact can be compensated along with maternal recovery in the course of child development. Moreover, the research has concentrated so far on the consequences of postnatal depression for child development. This could have led to the assumption that postnatal depression in the mother in particular is detrimental to a child although maternal depressive symptoms at any other stage of child development may be equally or even more harmful, as these results suggest. Gender difference was also found in this study: compared with girls, boys seemed to be more vulnerable.

Finally, the finding that maternal prenatal depressive symptomatology was such a strong predictor of 8- to 9-year-old children's problems was striking. There are many possible explanations for this finding. As the study by Kumar and Robson (1984) suggests, maternal life-long psychiatric disturbance may be associated with prenatal but not with postnatal depressive symptoms, which in turn may be associated with poorer child outcome due to both genetic and environmental factors. Unfortunately, the duration of the previous symptoms and the psychiatric history of the mothers could not be studied in this analysis.

Other explanations include the possible physiological mechanisms associated with prenatal depression having direct and indirect effects on the unborn child (Green and Murray, 1994). In animal studies maternal stress during pregnancy has had long-lasting or even permanent effects on the fetal brain, and these changes are likely to influence the behavior and adaptive capacity of the offspring (Nelson and Bosquet, 2000). Similar mechanisms could account for the possible physiological effects of maternal depression on the fetus in humans, because increased stress levels are often related to depression, and physiological changes have been found in depressed individuals (Nelson and Bosquet, 2000). Symptoms of dysregulation have been found among newborns of prenatally depressed mothers, and this dysregulation is likely to have a negative impact on the early mother–infant relationship whether the mother is depressed or not (Field, 1997). The possible continuity of the mothers' negative feelings toward the child from pregnancy until middle childhood and the association of these negative feelings with poorer child outcome may be of importance. The stability of some relationship patterns, such as the quality of the attachment relationship, could also offer explanations, but further research is needed (Zeanah et al., 1997).

Limitations

To have a moderate-sized sample, only the questionnaires of the follow-up study were analyzed in this report; the research interviews made for smaller subsamples were not used here. This is an obvious limitation in this part of the study. Symptoms of depression are not specific to affective disorder, but can be associated with other psychiatric problems or stressful life situations (Hammen et al., 1987). The sensitivity of the EPDS was lower than the specificity in this sample, suggesting that some mothers who were actually depressed scored low on the EPDS, whereas the mothers who scored high were very likely to have clinical depression. This may cause some bias, not only concerning the prevalence of depression but also on the instability of depressive symptoms. Because a fairly high cutpoint in the EPDS was used, the proportion of symptomatic mothers at each assessment point was lim-

ited. It is probable that some of the mothers who scored high at one assessment point scored just below the cut-point at the next point in time. This may partially explain the discontinuity in the symptoms.

In this study attrition increased in the course of the survey. In addition, the proportion of subjects with incomplete data increased in successive stages and reduced the sample size. Although the excluded respondents and dropout groups did not seem to differ from the study sample, it is still possible that mothers and children with more distress were more likely to drop out from the study.

Because of the study design it was not possible to estimate the severity and the duration of maternal depressive symptoms and the possible family history of depression more accurately. There was also a long time interval from the postnatal stage to the latest study stage, and the depressive symptoms of the mothers during this interval were not considered here.

The fathers' views and functioning were not considered in this analysis. However, data were also collected from the fathers, and this aspect needs to be analyzed.

Because of these limitations, the results are tentative and need to be confirmed. The long-term consequences of maternal prenatal depression for the child and the significance of the timing of maternal depression require particular attention in future research.

Clinical Implications

In the light of these results it is important to note maternal depressive symptoms at each stage of motherhood, beginning at the prenatal stage. The findings show that the self-reported depressive symptoms of the mothers are of importance. Thus it is worthwhile to screen maternal depressive symptoms, for example by means of self-report forms or simply by asking pregnant mothers how are they feeling. Identifying mothers in need of support at an early stage is also a way to promote the mental health of the unborn child. The screening and promotion of children's healthy development is necessary as early as possible. Risks do matter from the very beginning.

REFERENCES

Achenbach TM (1991a), *Manual for the Child Behavior Checklist/4–18 and 1991 Profile*. Burlington: University of Vermont Department of Psychiatry

Achenbach TM (1991b), *Manual for the Teacher's Report Form and 1991 Profile*. Burlington: University of Vermont Department of Psychiatry

Beardslee WR, Versage EM, Gladstone TRG (1998), Children of affectively ill parents: a review of the past 10 years. *J Am Acad Child Adolesc Psychiatry* 37:1134–1141

Campbell SB, Cohn JF, Meyers T (1995), Depression in first-time mothers: mother–infant interaction and depression chronicity. *Dev Psychol* 31:349–357

Chilcoat HD, Breslau N (1997), Does psychiatric history bias mothers' reports? An application of a new analytic approach. *J Am Acad Child Adolesc Psychiatry* 36:971–979

Cicchetti D (1990), A historical perspective on the discipline of developmental psychopathology. In: *Risk and Protective Factors in the Development of Psychopathology,* Rolf J, Masten AS, Cicchetti D, Nuechterlein KH, Weintraub S, eds. Cambridge, England: Cambridge University Press, pp 2–28

Conrad M, Hammen C (1989), Role of maternal depression in perceptions of child maladjustment. *J Consult Clin Psychol* 57:663–667

Cox J (1994), Origins and development of the 10-item Edinburgh Postnatal Depression Scale. In: *Perinatal Psychiatry: Use and Misuse of the Edinburgh Postnatal Depression Scale,* Cox J, Holden J, eds. London: Gaskell, pp 115–124

Cox JL, Chapman G, Murray D, Jones P (1996), Validation of the Edinburgh Postnatal Depression Scale (EPDS) in non-postnatal women. *J Affect Disord* 39:185–189

Cummings EM, Davies PT (1994), Maternal depression and child development. *J Child Psychol Psychiatry* 35:73–112

Dierker LC, Merikangas KR, Szatmari P (1999), Influence of parental concordance for psychiatric disorders on psychopathology in offspring. *J Am Acad Child Adolesc Psychiatry* 38:280–288

Field T (1997), The treatment of depressed mothers and their infants. In: *Postpartum Depression and Child Development,* Murray L, Cooper P, eds. New York: Guilford, pp 221–236

Goodman SH, Brogan D, Lynch ME, Fielding B (1993), Social and emotional competence in children of depressed mothers. *Child Dev* 64:516–531

Green JM, Murray D (1994), The use of the Edinburgh Postnatal Depression Scale in research to explore the relationships between antenatal and postnatal dysphoria. In: *Perinatal Psychiatry: Use and Misuse of the Edinburgh Postnatal Depression Scale,* Cox J, Holden J, eds. London: Gaskell, pp 180–198

Hammen C, Adrian C, Gordon D, Burge D, Jaenicke C, Hiroto D (1987), Children of depressed mothers: maternal strain and symptom predictors of dysfunction. *J Abnorm Psychol* 96:190–198

Kumar R, Robson K (1984), A prospective study of emotional disorders in childbearing women. *Br J Psychiatry* 144:35–47

Murray D, Cox JL, Chapman G, Jones P (1995), Childbirth: life event or start of a long-term difficulty? Further data from the Stoke-on-Trent controlled study of postnatal depression. *Br J Psychiatry* 166:595–600

Murray L, Hipwell A, Hooper R, Stein A, Cooper P (1996), The cognitive development of 5-year-old children of postnatally depressed mothers. *J Child Psychol Psychiatry* 37:927–935

Nelson CA, Bosquet M (2000), Neurobiology of fetal and infant development: implications for infant mental health. In: *Handbook of Infant Mental Health,* Zeanah CH, ed. New York: Guilford, pp 37–59

Puura K (1998), What children tell and adults notice: psychiatric disturbances among Finnish children. Academic dissertation, Acta Universitatis Tamperensis 605, Tampere, Finland

Rutter M (1989), Pathways from childhood to adult life. *J Child Psychol Psychiatry* 30:23–51

Rutter M (1990), Commentary: some focus and process considerations regarding effects of parental depression on children. *Dev Psychol* 26:60–67

Tamminen T (1990), Postnatal depression, breastfeeding and mother–infant interaction. Academic dissertation (in Finnish with a summary in English), Acta Universitatis Tamperensis ser A vol 304, Tampere, Finland

Teti DM, Gelfand DM, Messinger DS, Isabella R (1995), Maternal depression and the quality of early attachment: an examination of infants, preschoolers, and their mothers. *Dev Psychol* 31:364–376

Todd RD, Neuman R, Geller B, Fox LW, Hickok J (1993), Genetic studies of affective disorders: should we be starting with childhood onset probands? *J Am Acad Child Adolesc Psychiatry* 32:1164–1171

Tronick EZ, Weinberg MK (1997), Depressed mothers and infants: failure to form dyadic states of consciousness. In: *Postpartum Depression and Child Development,* Murray L, Cooper P, eds. New York: Guilford, pp 54–81

Warner V, Weissman MM, Mufson L, Wickramaratne PJ (1999), Grandparents, parents, and grandchildren at high risk for depression: a three-generation study. *J Am Acad Child Adolesc Psychiatry* 38:289–296

Zeanah CH, Boris NW, Larrieu JA (1997), Infant development and developmental risk: a review of the past 10 years. *J Am Acad Child Adolesc Psychiatry* 36:165–178