

# Maternal Mental Health, Substance Use, and Domestic Violence in the Year After Delivery and Subsequent Behavior Problems in Children at Age 3 Years

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**Context:** Mental health disorders, substance use, and domestic violence often occur together. However, studies examining the impact of these conditions in mothers on the well-being of their children have focused only on isolated conditions.

**Objective:** To examine the cumulative effect of maternal mental health disorders, substance use, and domestic violence on the risk of behavior problems in young children.

**Design:** A birth cohort (1998-2000) followed up to age 3 years.

**Setting:** Eighteen large US cities.

**Participants:** At 3 years, 2756 (65%) were followed up from the population-based birth cohort of 4242. Thirty-six percent had annual incomes below the poverty threshold.

**Main Outcome Measures:** One year after delivery, mothers were asked questions about conditions in 3 categories: (1) mental health (major depressive episode and generalized anxiety disorder), (2) substance use (smok-

ing, binge drinking, and illicit drug use), and (3) domestic violence (emotional and physical). At 3 years, mothers completed questions from the Child Behavior Checklist.

**Results:** Fifty percent of mothers had a condition in at least 1 of the 3 categories. The prevalence of child behavior problems increased with the number of categories (0, 1, 2, or 3) in which the mother reported a condition: respectively, 7%, 12%, 17%, and 19% for aggression ( $P < .001$ ); 9%, 14%, 16%, and 27% for anxious/depressed ( $P < .001$ ); and 7%, 12%, 15%, and 19% for inattention/hyperactivity ( $P < .001$ ). This graded risk persisted after adjustment for sociodemographic and prenatal factors and for paternal mental health and substance use.

**Conclusions:** The risk of child behavior problems increased with the number of areas—mental health, substance use, or domestic violence—in which the mother reported difficulties. Preventing behavior problems in young children requires family-oriented strategies that address the needs of both parents and their children.

*Arch Gen Psychiatry.* 2006;63:551-560

**T**HE IDENTIFICATION OF BEHAVIOR problems in children appears to have become more common.<sup>1-4</sup>

Such problems reflect children's social and emotional functioning, and these aspects of children's functioning are a major focus for health care providers and parents when assessing children's overall health and well-being.<sup>5-7</sup> In an effort to understand the cause of children's behavior problems and to prevent their occurrence, researchers have focused on various maternal conditions that may contribute to behavior problems and that may be improved by clinical intervention. These include mood<sup>8,9</sup> and anxiety<sup>10,11</sup> disorders, smoking,<sup>12,13</sup> problem drinking and illicit drug use,<sup>14</sup> and domestic violence.<sup>15,16</sup> Although the im-

pacts of these maternal conditions on children's behavior problems are usually examined separately, the conditions frequently co-occur.<sup>17-19</sup>

Co-occurring conditions in the areas of mental health, substance use, and domestic violence can significantly impair maternal functioning. However, to our knowledge, no study has integrated information about maternal conditions in these 3 areas or examined how a cumulative measure of these maternal conditions is related to children's social and emotional functioning. An added challenge in such a study is to separate the impact of maternal conditions on child behavior problems from the effects of disadvantaged social circumstances, prenatal exposures, and mental health and substance use problems in the father.<sup>20,21</sup>

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In this study, we examined the hypothesis that the risk of clinically significant behavior problems in 3-year-olds would increase with the number of maternal conditions that occurred in 3 areas—mental health, substance use, and domestic violence—during the year after delivery. We expected that this association would persist after controlling for sociodemographic factors, the father's mental health and substance use, and the child's intrauterine exposure to domestic violence and to maternal use of alcohol and illicit drugs.

## METHODS

### OVERVIEW OF THE STUDY DESIGN AND SAMPLE

The Fragile Families and Child Wellbeing Study is an ongoing birth cohort study following up 4898 children. The multistage sample selection has been described elsewhere in detail,<sup>22</sup> and it is briefly summarized herein. Between 1998 and 2000, births were randomly selected in 75 birth hospitals, which were located across 20 large US cities (population >200 000) in 15 states. Nonmarital births (so-called fragile families) were oversampled relative to marital births (ratio, approximately 3:1). Families were ineligible (<5% of sampled births) if the child was being placed for adoption, if the mother did not speak either English or Spanish well enough to understand the survey, or if the mother was too ill after delivery to complete the interview. Most of the birth hospitals did not allow mothers less than 18 years of age to participate. Among eligible mothers, 82% of those married and 87% of those unmarried agreed to participate.

Mothers and fathers were surveyed separately at delivery, and various aspects of parental well-being were assessed in separate follow-up surveys of each parent 1 year after delivery. Three years after delivery, mothers were surveyed about their children's behavior. The behavior questions required for our analysis were not asked in 2 cities. Therefore, this study involved only births from 18 cities. Of the 4242 birth mothers originally sampled in these 18 cities, 2886 (68%) participated in the survey at 3 years. Among the mothers in the 18 cities, there were no significant differences in baseline marital status, age, or education between those who were followed up at 3 years and those who were not. However, among the mothers who were followed up, the mean household annual income was lower (poverty-to-income ratio at child's birth, 2.05 vs 2.20,  $t_{4241} = -2.15$ ,  $P = .03$ ). In addition, the racial/ethnic composition of the mothers was different between those who were followed up and those who were not (non-Hispanic white, 23% vs 21%; non-Hispanic black, 51% vs 46%; Hispanic, 23% vs 28%; other race/ethnicity, 3% vs 5%;  $\chi^2 = 17.9$ ,  $P < .001$ ).

The institutional review boards at all birth hospitals, as well as those at Princeton and Columbia universities, approved the data collection procedures. All participants gave informed written consent.

### CHILD BEHAVIOR PROBLEMS

Mothers were asked items from the Child Behavior Checklist designed for children 1½ to 5 years of age, an extensively validated instrument used to rate behavior problems in several domains.<sup>23</sup> The mother was read a series of statements about her child's behavior and asked whether the statement was "not true," "sometimes or somewhat true," or "very true or often true."

We focused on behavior problems in 3 domains, 2 of which were based on empirically derived scales: aggressive (19 items, such as "gets in many fights" and "hurts animals or people with-

out meaning to") and anxious/depressed (8 items, such as "looks unhappy without good reason" and "is too fearful or anxious"). The third domain—attention-deficit/hyperactivity (6 items, such as "can't concentrate, can't pay attention for long" and "can't sit still; is restless or hyperactive")—was derived by a different process.<sup>24</sup> These items on the Child Behavior Checklist were selected by a panel of psychiatrists and psychologists as being the most consistent with the diagnosis of attention-deficit/hyperactivity disorder in the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)*.<sup>25</sup> However, because the diagnosis of attention-deficit/hyperactivity disorder is not customarily made in preschoolers and because this scale is not a diagnostic instrument for the disorder,<sup>26</sup> we will refer to this domain as inattention/hyperactivity.

For each of these 3 behavior domains, we computed a score from the items that make up each scale and converted the scale score to a percentile, based on normative data.<sup>23,27</sup> Children with scores in the 93rd percentile or higher (T score,  $\geq 65$ ) were considered to have significant problems in a given behavior domain. When we computed the 3 behavior scores, if data were missing for more than 3 items on the aggressive scale or more than 1 item on either of the other scales, we considered the behavior outcome missing for that child. Otherwise, we replaced the value for the missing item with the median value of the other answered items on the scale.

### MATERNAL CONDITIONS

Using questions on the survey 1 year after delivery, we created yes/no variables for 6 maternal conditions: (1) major depressive episode, (2) generalized anxiety disorder, (3) smoking, (4) binge drinking—illicit drug use, (5) physical domestic violence, and (6) emotional domestic violence. We used the World Health Organization Composite International Diagnostic Interview Short Form (CIDI-SF, version 1.0) to assess the prevalence of major depressive episode and generalized anxiety disorder.<sup>28</sup>

We used the suggested CIDI-SF scoring method to classify a mother as having had a major depressive episode.<sup>29</sup> To be classified in this way, a mother had to report having had a 2-week period in the preceding year during which she experienced either dysphoric mood (felt sad, blue, or depressed) or anhedonia (lost interest in most things) to a significant degree (the symptom lasted for at least most of the day, almost every day). She also had to report having had at least 3 other DSM-IV symptoms of major depression, such as feeling tired, having trouble sleeping, or thinking about death.

Version 1.0 of the CIDI-SF contained a minor error in the question skip pattern.<sup>30</sup> As a result, some mothers who reported feeling sad or depressed "about half the day" were not subsequently asked questions about the intensity of their symptom of anhedonia (4% of our sample). We scored these mothers as having had a major depressive episode if they reported any anhedonia and at least 2 of the other DSM-IV depressive symptoms (2.5% of our sample). We did not ask the mothers about their use of antidepressants, but during the administration of the CIDI-SF, 6 mothers spontaneously mentioned that they were being treated with such medication. We considered these mothers to have had a major depressive episode.

The CIDI-SF contained all the questions necessary for a full diagnostic assessment of generalized anxiety disorder, as defined by the DSM-IV, and the scoring followed published guidelines.<sup>29</sup> We classified a mother as having the disorder if she had had a period of more than 6 months during which she felt excessively worried or anxious about more than one thing, more days than not, and had difficulty controlling her worries.

We considered a mother a smoker if she reported having smoked cigarettes during the preceding month. A mother was

considered as having a problem with binge drinking—illicit drug use if she reported any of the following: (1) having “5 or more drinks in 1 day” on 2 or more occasions in the past month, (2) smoking “marijuana or pot” at least “a few times” in the past month, (3) using “cocaine, crack, speed, LSD, or heroin or any other kind of hard drug” in the past month, (4) that “drinking or using drugs [had] interfered with how [she] managed on a day-to-day basis” or “with [her] personal relationships” since her child was born, or (5) seeking help or being treated “for drug or alcohol problems” since the child was born.

The mothers were asked 6 questions about domestic violence in each of 2 possible relationships—with the biological father or with a current intimate partner other than the father. A mother was asked about her relationship with the biological father only if she had been either married or “romantically involved” with the father at the time of the child’s birth or at the time of the 1-year survey. If the mother reported not living with the biological father but lived “most of the time” with a current romantic partner other than the father, she was instructed to answer the 6 questions about domestic violence with that intimate partner in mind. Mothers who were not classified as having either type of relationship (14%) were not asked any of the 6 questions and were considered to have experienced no emotional or physical domestic violence.

We considered a mother to have experienced emotional domestic violence if she reported that the biological father or current partner “sometimes” or “often” (as opposed to “never”) “tried to keep [her] from seeing or talking to [her] friends or family,” “tried to prevent [her] from going to work or school,” or “withheld money, made [her] ask for money, or took [her] money” (3 questions). A mother was considered to have experienced physical domestic violence if she reported that the father or current partner “sometimes” or “often” (as opposed to “never”) “slapped or kicked [her]” or “hit [her] with his fist or an object that could hurt [her]” (2 questions). If the relationship with the biological father had ended, we asked the mother to answer these 5 questions in terms of the last month of the relationship. We also considered a mother to have experienced physical domestic violence if she reported that she had ever been “cut, bruised, or seriously hurt in a fight” with the father or her current partner (1 question).

## STUDY COVARIATES

We controlled for covariates that might confound the association we wished to investigate between our primary exposures, the maternal conditions, and our primary outcomes, the child behavior problems. Using items from the parental surveys at birth and 1 year after delivery, we constructed 19 variables for sociodemographic factors (10 variables), prenatal factors (5 variables), and paternal mental health and substance use (4 variables).

## SOCIODEMOGRAPHIC FACTORS

We computed household income as a ratio of income to the federal poverty line for the year of reporting (with adjustment for household size). We used the mothers’ reports from the 1-year survey of income from all sources in the household in the preceding year. In 135 cases (4.9% of the sample) income was not reported, and it was imputed by means of a regression model containing other sociodemographic variables in the 1-year survey. We obtained the mother’s age at delivery, race/ethnicity, education level, and relationship status with the father (married, cohabiting, or single) from the survey at birth. Variables obtained from the mother at the 1-year survey included number of children in the household, months of em-

ployment in the previous year (<1 month and 1-6, 7-11, and 12 months), history of the father ever being in jail, and amount of paternal involvement with the child (father sees the child <1 time per week vs  $\geq 1$  time per week). Mothers were considered to have experienced material hardship (yes or no) due to lack of money during the preceding 12 months if they had been “evicted from [their] home or apartment for not paying the rent or mortgage,” if they had “service turned off by the gas or electric company,” or if “the oil company did not deliver oil.”

## PRENATAL FACTORS

We derived all prenatal factors, including the child’s birth weight, whether the child was part of a multiple birth, and maternal smoking during the pregnancy, from questions on the survey at birth. Children were considered to have been exposed to prenatal alcohol or illicit drugs if the mother reported that during pregnancy she drank alcoholic beverages at least “several times a month” or ever used “marijuana, crack cocaine, or heroin.” We considered as prenatal physical domestic violence any case in which the mother reported that during pregnancy the child’s father “sometimes” or “often” “hit or slapped [her] when he was angry.” It was also considered to have occurred if “violence [or] abuse” was among the reasons the mother selected for no longer being romantically involved with, living with, or being married to the father.

## PATERNAL CONDITIONS

Using questions on the paternal survey at 1 year, we created yes/no variables for 4 paternal conditions: major depressive episode, generalized anxiety disorder, smoking, and binge drinking—illicit drug use. These survey questions and the method of variable construction were identical to those used for the maternal conditions.

## STATISTICAL ANALYSIS

The final sample used in the analysis contained 2756 cases. Of the 2886 survey respondents, we excluded 120 because they were missing data on all 3 child behavior outcomes and an additional 10 because data were missing on more than 1 of 6 maternal conditions. For the 42 mothers missing data on only 1 condition, we made the conservative assumption that the mother was not affected by that condition.

We analyzed all the variables as categorical variables, and the significance of all bivariate associations was evaluated by  $\chi^2$  tests. We assessed the pattern of maternal comorbidity by examining the association of each maternal condition with the other 5 conditions. On the basis of that pattern of comorbidity, we classified mothers according to whether they had conditions in 1 of 3 categories—mental health (major depressive episode or generalized anxiety disorder), substance use (smoking or binge drinking—illicit drug use), and domestic violence (emotional or physical). To assess the cumulative risk of maternal conditions for child behavior problems, we created a score (0 to 3) based on the number of categories in which the mother reported having a condition in the year after delivery. We then examined the association between child behavior problems and the maternal condition score.

After first analyzing the bivariate association of each child outcome with each of the 19 covariates, we used multivariate regression models to control for the possible confounding effect of these covariates. Using a separate logistic regression model for each of the 3 child behavior problems, we estimated the odds of the behavior problem according to the maternal condition

**Table 1. Prevalence of Child Behavior Problems at 3 Years of Age and of Maternal Health Conditions 1 Year After Delivery**

	Proportion (%)
Child behavior problems	
Aggressive	282/2753 (10.2)
Anxious/depressed	342/2753 (12.4)
Inattention/hyperactivity	281/2755 (10.2)
Maternal health conditions	
Major depressive episode	387/2750 (14.1)
Generalized anxiety disorder	97/2732 (3.6)
Smoking	769/2756 (27.9)
Binge drinking–illicit drug use	137/2751 (5.0)
Emotional domestic violence	565/2749 (20.6)
Physical domestic violence	244/2755 (8.9)

score, after adjusting for the 10 sociodemographic and 5 prenatal covariates. Of the 2756 cases, only 2177 (79%) had data available on the 4 paternal conditions. We repeated the logistic regression analysis on this subset and then included the 4 paternal conditions as additional covariates.

## RESULTS

The prevalence of significant child behavior problems in each of the 3 domains—aggressive, anxious/depressed, and inattention/hyperactivity—was more than 10% (**Table 1**), and 22% of children had a behavior problem in at least 1 domain. The prevalence of the 6 maternal conditions ranged from 3.6% for generalized anxiety disorder to 27.9% for smoking (Table 1). In the year after delivery, 14.1% of mothers had symptoms that were consistent with a major depressive episode. Almost 9% of mothers reported physical domestic violence, while more than twice that many reported emotional domestic violence.

Half of the mothers were non-Hispanic black, and almost another fourth were Hispanic; more than one third lived below the poverty threshold; and almost one third had not finished high school (**Table 2**). One year after delivery, 79% of fathers were seeing their children at least once a week. During pregnancy, approximately 20% of the mothers smoked, 5.9% reported alcohol or illicit drug use, and 3.4% reported physical domestic violence from the father. Of the 15 sociodemographic and prenatal covariates, 11 were significantly related to at least 2 child behavior problems (Table 2).

The fathers tended to have a lower prevalence than mothers of major depression and generalized anxiety disorder, but a higher prevalence of smoking and binge drinking–illicit drug use (Table 2). While paternal smoking was associated with all 3 behavior problems, the only other statistically significant association for these paternal conditions was between major depression and child aggression (Table 2).

There was a consistent pattern of association between each maternal condition and child behavior problems (**Table 3**). The risk of a significant behavior problem ranged from 20% higher to more than 100% higher depending on the maternal condition and the particular domain of child behavior. Maternal depression and anxiety tended to be as-

sociated with a stronger risk of child behavior problems than the other 4 maternal conditions.

Mothers with any given condition were at a significantly higher risk than those without that condition to have each of the other 5 conditions (data not shown), underscoring the comorbidity among these conditions. For example, smokers were 50% (95% confidence interval, 20%-80%) more likely than nonsmokers to have had a major depressive episode. Of particular note, 76% of mothers with generalized anxiety disorder had experienced a major depressive episode, 62% of mothers with binge drinking–illicit drug use were smokers, and 63% of mothers reporting physical domestic violence also reported emotional domestic violence. Because of these 3 particular associations, we grouped the 6 maternal conditions into 3 categories: mental health, substance use, and domestic violence. A mother with a condition in any one of these 3 categories was at increased risk of having a condition in the other 2 categories (**Table 4**).

As a summary measure of maternal conditions 1 year after delivery, we created a score from 0 to 3 based on the number of categories in which the mother had a condition (**Table 5**). Although half the women had no condition in any category, of mothers who had a condition in any 1 category, 32% had a condition in at least 1 other category. As the score increased from 0 to 3, so did the risk of significant behavior problems in the child at 3 years of age (Table 5).

In multivariate logistic regression analysis that adjusted for the sociodemographic and prenatal covariates, the risk of behavior problems in each of the 3 domains increased with an increasing maternal condition score (**Table 6**). In these models, lower levels of father involvement (seeing the child <1 time per week) was associated with an increased risk of behavior problems in the anxious/depressed and inattention/hyperactivity domains independent of the parents' marital status at birth. When these same models were run on the subset of cases with data available on paternal conditions, the odds ratios associated with the maternal condition scores were somewhat higher (**Table 7**). When the paternal conditions were added to these models, the association between the maternal condition score and child aggression was attenuated but remained significant and increased with the maternal score.

## COMMENT

In a birth cohort drawn from 18 US cities, we have demonstrated that the risk of behavior problems in 3-year-olds increased with the number of categories—mental health, substance use, and domestic violence—in which the mother reported a condition in the year after delivery. This graded increase in risk was independent of a variety of sociodemographic and prenatal factors, as well as measures of paternal mental health and substance use in the year after delivery. Half of the mothers reported a condition in at least 1 of the 3 categories; and among these mothers, almost one third reported a condition in at least 1 other category.

It was not our primary purpose to estimate the risk of child behavior problems due to any single maternal

**Table 2. Prevalence of Child Behavior Problems by Level of Sociodemographic, Prenatal, and Paternal Factors**

	Prevalence of Factor, No.* (%)	Prevalence of Child Behavior Problem, %		
		Aggressive	Anxious/Depressed	Inattention/Hyperactivity
<b>Household income-to-poverty ratio</b>				
<1.0	1193 (43.3)	13.9	17.3	11.7
1.0-1.9	674 (24.4)	11.1	12.3	11.9
2.0-2.9	413 (15.0)	6.5	7.8	9.4
≥3.0	476 (17.3)	3.2	4.4	4.8
χ <sup>2</sup> Value		49.8	62.4	20.1
P value†		<.001	<.001	<.001
<b>Maternal education</b>				
<High school	874 (31.8)	14.7	19.2	12.1
High school degree or equivalent	865 (31.4)	10.6	13.9	11.6
Some college	710 (25.8)	7.3	6.8	9.2
≥College graduate	304 (11.0)	3.3	2.0	3.3
χ <sup>2</sup> Value		41.2	90.2	22.0
P value		<.001	<.001	<.001
<b>Maternal race/ethnicity</b>				
White, non-Hispanic	637 (23.1)	6.8	6.6	7.7
Black, non-Hispanic	1389 (50.5)	11.9	14.1	11.6
Hispanic, any race	637 (23.2)	9.8	14.3	9.6
Other race, non-Hispanic	89 (3.2)	13.5	14.6	11.2
χ <sup>2</sup> Value		13.6	25.9	7.6
P value		.003	<.001	.05
<b>Maternal relationship status at birth</b>				
Married	675 (24.5)	4.6	4.7	5.2
Cohabiting	991 (36.0)	9.7	13.1	10.6
Single	1090 (39.5)	14.2	16.5	12.9
χ <sup>2</sup> Value		42.6	54.0	27.6
P value		<.001	<.001	<.001
<b>Maternal age, y</b>				
<20	502 (18.2)	12.8	17.7	11.2
20-29	1633 (59.3)	10.9	12.3	11.1
≥30	620 (22.5)	6.5	8.4	7.1
χ <sup>2</sup> Value		13.8	22.1	8.4
P value		.001	<.001	.01
<b>Amount of paternal involvement</b>				
Sees child ≥1 time/wk	2173 (79.0)	9.1	10.8	9.2
Sees child <1 time/wk	579 (21.0)	14.5	18.5	14.2
χ <sup>2</sup> Value		14.4	25.3	12.5
P value		<.001	<.001	<.001
<b>Father ever in jail</b>				
Yes	777 (28.2)	16.9	16.4	14.4
No	1979 (71.8)	7.6	10.9	8.5
χ <sup>2</sup> Value		52.0	15.4	21.1
P value		<.001	<.001	<.001
<b>No. of children in household</b>				
1	843 (30.6)	8.0	11.7	11.3
2-3	1461 (53.0)	10.8	11.8	9.7
≥4	452 (16.4)	12.9	15.7	9.7
χ <sup>2</sup> Value		8.6	5.5	1.6
P value		.01	.06	.46
<b>Material hardship‡</b>				
Yes	204 (7.4)	17.2	18.6	17.6
No	2544 (92.6)	9.7	12.0	9.6
χ <sup>2</sup> Value		11.3	7.7	13.2
P value		<.001	.006	<.001

(continued)

**Table 2. Prevalence of Child Behavior Problems by Level of Sociodemographic, Prenatal, and Paternal Factors (cont)**

	Prevalence of Factor, No.* (%)	Prevalence of Child Behavior Problem, %		
		Aggressive	Anxious/Depressed	Inattention/Hyperactivity
<b>Maternal employment in prior year</b>				
<1 mo	906 (32.9)	10.9	15.5	11.5
1-6 mo	616 (22.3)	12.7	14.0	11.1
7-11 mo	515 (18.7)	8.0	9.3	7.2
12 mo	719 (26.1)	8.9	9.5	10.0
χ <sup>2</sup> Value		8.8	19.5	7.2
P value		.03	<.001	.06
<b>Prenatal smoking</b>				
None	2207 (80.2)	9.4	11.8	9.4
<1 pack/d	476 (17.3)	13.2	13.9	12.4
≥1 pack/d	69 (2.5)	18.8	20.6	20.3
χ <sup>2</sup> Value		12.1	5.8	11.6
P value		.002	.06	.003
<b>Prenatal physical domestic violence</b>				
Yes	94 (3.4)	19.2	21.3	14.9
No	2662 (96.6)	9.9	12.1	10.0
χ <sup>2</sup> Value		8.4	7.0	2.3
P value		.004	.008	.13
<b>Prenatal alcohol/illicit drug use</b>				
Yes	162 (5.9)	13.6	16.7	10.5
No	2587 (94.1)	10.1	12.2	10.2
χ <sup>2</sup> Value		2.0	2.8	0.01
P value		.15	.09	.91
<b>Birth weight, g</b>				
<1500	50 (1.8)	10.0	18.0	18.0
1500-2499	240 (8.8)	10.4	12.5	12.5
≥2500	2452 (89.4)	10.1	12.3	9.7
χ <sup>2</sup> Value		0.02	1.5	5.4
P value		.99	.48	.07
<b>Multiple birth</b>				
Yes	60 (2.2)	10.0	5.0	8.3
No	2696 (97.8)	10.2	12.6	10.2
χ <sup>2</sup> Value		0.004	3.1	0.2
P value		.95	.08	.63
<b>Paternal major depressive episode</b>				
Yes	209 (9.6)	13.9	14.4	12.0
No	1972 (90.4)	8.1	10.8	9.1
χ <sup>2</sup> Value		8.0	2.5	1.9
P value		.005	.12	.16
<b>Paternal generalized anxiety disorder</b>				
Yes	58 (2.7)	10.3	17.2	15.5
No	2123 (97.3)	8.6	10.9	9.2
χ <sup>2</sup> Value		0.2	2.3	2.7
P value		.65	.13	.10
<b>Paternal smoking</b>				
Yes	916 (42.0)	12.0	13.3	12.1
No	1265 (58.0)	6.2	9.5	7.4
χ <sup>2</sup> Value		22.3	7.9	14.3
P value		<.001	.005	<.001
<b>Paternal binge drinking-illicit drug use</b>				
Yes	493 (22.6)	9.4	12.2	9.2
No	1688 (77.4)	8.5	10.8	9.4
χ <sup>2</sup> Value		0.4	0.7	0.03
P value		.55	.39	.85

\*Subjects had missing data for a given factor where the total number was less than 2756 for any characteristic. Data on paternal conditions were available only on a subset of the sample (n = 2177) in which the father responded to the 12-month survey.

†P values are for χ<sup>2</sup> tests.

‡Mother reported that in the past 12 months either she had been evicted because she could not pay rent or mortgage, or she had had the gas, electric, or oil shut off because she could not pay the bill.

condition independent of the effect of other related maternal conditions. This is because in clinical practice, as supported by our data, mothers often have more than 1 condition, and children's true risk reflects the cumulative impact of these related maternal conditions. Furthermore, efforts to address any single maternal condition, such as smoking, may have limited success unless

they also address comorbid conditions such as depression or domestic violence.<sup>31,32</sup>

This nonexperimental study cannot prove that this potentially treatable group of maternal conditions results in poorer social and emotional functioning in children. However, the association between maternal conditions and child behavior problems was consistent across the 3 behavior domains, and it was also graded: the risk of behavior problems increased as the number of maternal conditions increased. We assessed all maternal conditions 2 years before the child behavior problems were assessed, and all associations between maternal conditions and child behavior persisted after we controlled for a number of potentially confounding factors.

Despite multiple studies linking individual maternal conditions with child behavior, we are unaware of any study that used a national sample of mothers and young children and examined the comorbidity of these maternal conditions or their cumulative impact on young

**Table 3. Prevalence and Relative Risk of Child Behavior Problems at 3 Years of Age by Maternal Health Condition 1 Year After Delivery**

Maternal Condition	Prevalence of Child Behavior Problem, %		
	Aggressive	Anxious/Depressed	Inattention/Hyperactivity
Major depressive episode			
Yes	18.4	20.5	17.6
No	8.8	11.1	9.0
Relative risk (95% CI)*	2.1 (1.6-2.7)	1.8 (1.5-2.3)	2.0 (1.5-2.5)
Generalized anxiety disorder			
Yes	19.8	24.0	16.5
No	9.9	12.0	10.0
Relative risk (95% CI)	2.0 (1.3-3.0)	2.0 (1.4-2.9)	1.6 (1.0-2.6)
Smoking			
Yes	13.8	14.3	13.4
No	8.9	11.7	9.0
Relative risk (95% CI)	1.6 (1.2-2.0)	1.2 (1.0-1.5)	1.5 (1.2-1.9)
Binge drinking-illicit drug use			
Yes	17.5	18.2	13.9
No	9.8	12.1	10.0
Relative risk	1.8 (1.2-2.6)	1.5 (1.0-2.2)	1.4 (0.9-2.1)
Emotional domestic violence			
Yes	12.6	17.0	12.6
No	9.6	11.3	9.6
Relative (95% CI)	1.3 (1.0-1.7)	1.5 (1.2-1.9)	1.3 (1.0-1.7)
Physical domestic violence			
Yes	16.0	22.5	11.9
No	9.7	11.4	10.0
Relative risk (95% CI)	1.6 (1.2-2.2)	2.0 (1.5-2.5)	1.2 (0.8-1.7)

Abbreviation: CI, confidence interval.

\*The 95% CI was computed by means of the Mantel-Haenszel estimate.

**Table 4. Proportion of Mothers With a Comorbid Health Condition in 3 Categories 1 Year After Delivery**

	Mental Health*	Substance Use†	Domestic Violence‡
Mental health			
Yes	NA	166/409 (40.6)	175/410 (42.7)
No	NA	651/2325 (28.0)	474/2321 (20.4)
Relative risk (95% CI)	NA	1.4 (1.3-1.7)	2.1 (1.8-2.4)
Substance use			
Yes	166/817 (20.3)	NA	263/821 (32.0)
No	243/1917 (12.7)	NA	391/1924 (20.3)
Relative risk (95% CI)	1.6 (1.3-1.9)	NA	1.6 (1.4-1.8)
Domestic violence			
Yes	175/649 (27.0)	263/654 (40.2)	NA
No	235/2082 (11.3)	558/2091 (26.7)	NA
Relative risk (95% CI)	2.4 (2.0-2.8)	1.5 (1.3-1.7)	NA

Abbreviations: CI, confidence interval; NA, not applicable.

\*Major depressive episode or generalized anxiety disorder.

†Smoking or binge drinking-illicit drug use.

‡Physical or emotional domestic violence.

**Table 5. Prevalence and Unadjusted Odds of Child Behavior Problems at 3 Years of Age by Number of Categories of Maternal Conditions When Child Was 1 Year Old**

	No. (%)	Aggressive		Anxious/Depressed		Inattention/Hyperactivity	
		%	OR (95% CI)*	%	OR (95% CI)*	%	OR (95% CI)*
No. of categories†							
0	1389 (50.4)	7.0	1.00	9.2	1.00	7.3	1.00
1	933 (33.9)	11.8	1.78 (1.34-2.37)	14.4	1.66 (1.28-2.14)	11.8	1.69 (1.27-2.24)
2	348 (12.6)	17.0	2.72 (1.92-3.85)	16.3	1.92 (1.37-2.69)	15.2	2.27 (1.59-3.23)
3	85 (3.1)	18.8	3.09 (1.72-5.52)	27.1	3.65 (2.19-6.09)	18.8	2.93 (1.64-5.23)
χ <sup>2</sup> Value		42.3		38.0		31.5	
P value‡		<.001		<.001		<.001	

Abbreviations: CI, confidence interval; OR, odds ratio.

\*The ORs and 95% CIs are from logistic regression models with the child condition as the dependent variable and the maternal conditions entered as 3 dummy variables.

†The 3 maternal condition categories were major depressive episode or generalized anxiety disorder; smoking or binge drinking-illicit drug use; and physical or emotional domestic violence.

‡P values are for χ<sup>2</sup> tests.

**Table 6. Adjusted\* Odds of Behavior Problems at 3 Years of Age by Number of Categories of Maternal Conditions When Child Was 1 Year Old**

	OR (95% CI)		
	Aggressive	Anxious/ Depressed	Inattention/ Hyperactivity
No. of categories of maternal conditions†			
0	1.00	1.00	1.00
1	1.47 (1.08-2.02)	1.45 (1.10-1.92)	1.50 (1.10-2.03)
2	1.94 (1.31-2.88)	1.52 (1.04-2.22)	1.73 (1.16-2.58)
3	1.92 (0.99-3.72)	3.03 (1.67-5.50)	2.06 (1.06-3.98)
Household income-to-poverty ratio			
<1.0	2.09 (1.10-3.96)	1.37 (0.80-2.35)	1.25 (0.72-2.16)
1.0-1.9	2.14 (1.14-4.03)	1.27 (0.74-2.19)	1.55 (0.91-2.65)
2.0-2.9	1.54 (0.78-3.04)	1.05 (0.58-1.91)	1.47 (0.84-2.58)
≥3.0	1.00	1.00	1.00
Maternal education			
<High school	1.51 (0.68-3.36)	4.57 (1.81-11.54)	1.94 (0.89-4.27)
High school degree or equivalent	1.23 (0.56-2.68)	3.84 (1.54-9.57)	1.98 (0.92-4.23)
Some college	0.95 (0.44-2.07)	1.99 (0.79-4.98)	1.61 (0.76-3.40)
≥College graduate	1.00	1.00	1.00
Maternal race/ethnicity			
White, non-Hispanic	1.00	1.00	1.00
Black, non-Hispanic	1.14 (0.76-1.71)	1.46 (0.98-2.17)	1.25 (0.85-1.84)
Hispanic, any race	1.06 (0.68-1.67)	1.48 (0.97-2.28)	1.06 (0.69-1.64)
Other race, non-Hispanic	2.32 (1.12-4.78)	2.77 (1.36-5.66)	1.78 (0.84-3.76)
Maternal relationship status at birth			
Married	1.00	1.00	1.00
Cohabiting	1.21 (0.75-1.93)	1.61 (1.04-2.51)	1.37 (0.88-2.14)
Single	1.70 (1.05-2.76)	1.79 (1.13-2.83)	1.61 (1.01-2.56)
Maternal age, y			
<20	1.12 (0.69-1.80)	1.15 (0.75-1.75)	0.89 (0.56-1.44)
20-29	1.17 (0.80-1.73)	0.98 (0.69-1.40)	1.10 (0.76-1.60)
≥30	1.00	1.00	1.00
Amount of paternal involvement			
Sees child ≥1 time/wk	1.00	1.00	1.00
Sees child <1 time/wk	1.02 (0.75-1.38)	1.32 (0.99-1.75)	1.20 (0.88-1.63)
Father ever in jail			
Yes	1.62 (1.23-2.14)	0.99 (0.76-1.29)	1.26 (0.95-1.66)
No	1.00	1.00	1.00
No. of children in household			
1	1.00	1.00	1.00
2-3	1.28 (0.92-1.76)	0.94 (0.70-1.25)	0.77 (0.57-1.03)
≥4	1.28 (0.85-1.93)	1.05 (0.73-1.52)	0.67 (0.44-1.02)
Material hardship‡			
Yes	1.30 (0.85-1.96)	1.18 (0.79-1.77)	1.51 (1.00-2.27)
No	1.00	1.00	1.00
Maternal employment in prior year			
<1 mo	1.02 (0.71-1.47)	1.41 (1.01-1.98)	1.18 (0.83-1.67)
1-6 mo	1.12 (0.77-1.63)	1.21 (0.84-1.73)	1.01 (0.69-1.46)
7-11 mo	0.96 (0.62-1.46)	1.06 (0.71-1.60)	0.79 (0.52-1.21)
12 mo	1.00	1.00	1.00
Prenatal smoking			
None	1.00	1.00	1.00
<1 pack/d	0.91 (0.64-1.30)	0.75 (0.53-1.06)	0.92 (0.64-1.32)
≥1 pack/d	1.40 (0.70-2.82)	1.28 (0.65-2.54)	1.78 (0.90-3.49)
Prenatal physical domestic violence			
Yes	1.31 (0.75-2.30)	1.32 (0.77-2.27)	1.07 (0.58-1.97)
No	1.00	1.00	1.00
Prenatal alcohol/illicit drug use			
Yes	0.94 (0.57-1.56)	0.98 (0.61-1.58)	0.68 (0.39-1.19)
No	1.00	1.00	1.00
Birth weight, g			
<1500	0.90 (0.34-2.37)	1.73 (0.80-3.73)	1.99 (0.93-4.27)
1500-2499	0.86 (0.55-1.37)	0.96 (0.63-1.47)	1.21 (0.79-1.86)
≥2500	1.00	1.00	1.00
Multiple birth			
Yes	1.02 (0.42-2.52)	0.35 (0.10-1.16)	0.77 (0.29-2.03)
No	1.00	1.00	1.00

Abbreviations: CI, confidence interval; OR, odds ratio.

\*Separate logistic regression models were constructed for each child behavior problem, and all ORs and 95% CIs were adjusted for all other variables in the model.

†The 3 maternal condition categories were major depressive episode or generalized anxiety disorder; smoking or binge drinking–illicit drug use; and physical or emotional domestic violence.

‡Mother reported that in the past 12 months either she had been evicted because she could not pay the rent or mortgage, or she had had the gas, electric, or oil shut off because she could not pay the bill.

**Table 7. Odds of Behavior Problems at 3 Years of Age by Number of Categories of Maternal Conditions When Child Was 1 Year Old, With and Without Adjusting for Paternal Conditions\***

	OR (95% CI)					
	Aggressive		Anxious/Depressed		Inattention/Hyperactivity	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
No. of categories of maternal conditions†						
0	1.00	1.00	1.00	1.00	1.00	1.00
1	1.43 (0.97-2.09)	1.35 (0.92-1.99)	1.43 (1.03-2.00)	1.42 (1.02-1.99)	1.49 (1.04-2.15)	1.46 (1.01-2.12)
2	2.31 (1.44-3.71)	2.16 (1.34-3.47)	1.58 (1.00-2.47)	1.57 (1.00-2.47)	2.05 (1.29-3.28)	2.00 (1.25-3.20)
3	2.63 (1.19-5.82)	2.48 (1.11-5.54)	3.68 (1.79-7.54)	3.56 (1.73-7.35)	3.15 (1.52-6.56)	3.05 (1.45-6.42)
Paternal major depressive episode	NA	1.41 (0.88-2.25)	NA	0.97 (0.61-1.54)	NA	0.98 (0.60-1.62)
Paternal generalized anxiety disorder	NA	0.66 (0.26-1.66)	NA	1.25 (0.58-2.72)	NA	1.48 (0.66-3.33)
Paternal smoking	NA	1.49 (1.06-2.09)	NA	1.04 (0.77-1.41)	NA	1.31 (0.95-1.82)
Paternal binge drinking–illicit drug use	NA	0.91 (0.62-1.33)	NA	1.06 (0.75-1.48)	NA	0.79 (0.55-1.15)

Abbreviations: CI, confidence interval; NA, not applicable; OR, odds ratio.

\*Separate logistic regressions models were constructed for each child behavior problem, and models were limited to cases with data on the 4 paternal conditions. In model 1, odds are adjusted for the following 15 covariates: household income-to-poverty ratio; maternal education, race/ethnicity, relationship status, and age; amount of paternal involvement; father ever in jail; number of children in household; material hardship; maternal employment; prenatal smoking, physical domestic violence, and alcohol or illicit drug use; birth weight; and multiple birth. In model 2, odds are adjusted for the 15 covariates plus the 4 paternal conditions.

†The 3 maternal health condition categories were major depressive episode or generalized anxiety disorder; smoking or binge drinking–illicit drug use; and physical or emotional domestic violence.

children. In a previous study using data from a nationally representative birth cohort, Kahn and colleagues<sup>21</sup> demonstrated that maternal smoking and depressive symptoms were often comorbid and that the persistence of either maternal smoking or depressive symptoms in the 3 years after delivery increased the risk of child behavior problems. A study<sup>33</sup> of mothers with children younger than 18 months of age, conducted at 4 Boston, Mass, pediatric health care sites, showed, as we have in this study, that maternal smoking, depressive symptoms, alcohol problems, and domestic violence frequently co-occurred, but that study<sup>33</sup> did not examine the relationship of this maternal comorbidity to child outcomes.

Because risk factors affecting children's health and well-being often cluster and interact with one another, others<sup>34-37</sup> have also attempted to develop a summary measure to assess cumulative risk. These other risk indexes, however, often combine measures of social disadvantage, like poverty, that are generally not modifiable by health care with maternal conditions, like depression and smoking, that can be altered by an integrated health care system. Although each of the 6 maternal conditions we studied is more common among socially disadvantaged families, each is amenable to interventions through the health care system<sup>38-42</sup>—interventions that could theoretically improve maternal and child well-being by acting synergistically with the social service efforts.<sup>43</sup> We have previously shown that maternal depression, smoking, and alcohol use explained between one fourth and one half of the association between low maternal social position and child behavior problems.<sup>44</sup>

We acknowledge several limitations in this study. The sample was drawn from large US cities and had an overrepresentation of nonmarital births. Although this may limit the generalizability of our findings, almost one third of US children are now born to unmarried parents,<sup>45</sup> and the factors influencing the behavioral health of these chil-

dren are important to understand. An additional limitation is that approximately one third of subjects were not followed up at 3 years. Thus, the prevalence estimates of the individual maternal conditions are not meant to be representative of all US women giving birth. There also were some limitations in the measurement of the 6 maternal conditions. Our category of "mental health" contained only 2 conditions, generalized anxiety disorder and major depressive episode, neither of which was established by a full diagnostic interview. The 12-month reporting period for a major depressive episode included the postpartum period, when the susceptibility to such an episode is increased. Neither binge drinking nor illicit drug use was established by means of standardized instruments, and there were no biomarkers for smoking. Social desirability bias in these mothers may have caused underreporting for all conditions. Domestic violence, in particular, may have been underreported, because mothers who were not romantically involved with the child's father and who were not living with a new partner were not asked the questions about domestic violence. Although we controlled for numerous variables associated with both our primary exposures and outcomes, there could still have been unmeasured factors that explained some of our observed associations.

Child behavior problems were based on maternal reports, and we cannot exclude the possibility that the maternal conditions themselves, such as depression, influenced how mothers perceived their children's behavior.<sup>46</sup> Although the assessment of maternal conditions preceded the assessment of child behavior problems, it is still possible that there was a pattern of infant behavior that contributed to the development of some maternal conditions, such as depression, and that also correlated with the child's behavior at 3 years of age.<sup>47</sup>

The comorbidity of maternal mental health problems, substance use, and domestic violence, along with the cu-

mulative risk they confer for child behavior problems, underscores both the need for family-oriented primary care and the challenges posed in providing such care.<sup>48</sup> Those providing health care to children face many barriers in identifying and responding to these conditions, but there is evidence that mothers appear open to empathetic inquiries about how they are doing<sup>33,49,50</sup> and that mothers also understand that their own well-being is related to that of their children.<sup>49,50</sup> The challenges of providing family-oriented care are, perhaps, best exemplified by the problem of domestic violence. There is strong evidence about the negative impact of domestic violence on the health of mothers and children, yet many questions remain for the medical profession and for society at large about how best to prevent, detect, and treat domestic violence.<sup>51,52</sup>

In the Adverse Childhood Experiences Study, Felitti and colleagues<sup>53</sup> retrospectively examined the long-term health impacts of children's exposure to parental mental health problems, substance use, and domestic violence. As the number of childhood exposures in these areas increased, so did the risk in adulthood of a number of health conditions and health behaviors, including depression, alcoholism, drug abuse, and smoking. Our study suggests that, by 3 years of age, there is already evidence of the effect of adverse childhood experiences, occurring in this study in the form of parental mental health problems, substance use, and domestic violence. Whether a clinician is focused primarily on the care of children, adults, or pregnant women, there is the potential to help disrupt this intergenerational transmission of poor health. Disrupting this cycle is not the job of any single field within medicine, nor can it be the job of the medical profession alone. However, to play their most useful role, health care providers might wish to consider the health and well-being of the family, the social unit involved in the transfer of health between generations, rather than limiting their focus to the individual patient or to a particular developmental period.

**Submitted for Publication:** January 24, 2005; final revision received June 3, 2005; accepted July 28, 2005.

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**Funding/Support:** These data analyses were supported by grants R01-HD41141 (Drs Whitaker and Kahn) and K23-HD40362-01 (Dr Kahn) from the National Institutes of Health. Data collection for the Fragile Families and Child Wellbeing Study was supported by grants from the National Institutes of Health (R01-HD36916) and a consortium of private foundations.

**Acknowledgment:** We thank Shannon Phillips for her technical assistance; Richard C. Wasserman, MD, MPH, and Christine M. Ross, PhD, for their helpful comments on earlier drafts of the manuscript; and Hillary L. Burdette, MD, MS, for her advice throughout the data analysis and the preparation of the manuscript.

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### Announcement

**Clinical Trials Registration Required.** In concert with the International Committee of Medical Journal Editors, *Archives of General Psychiatry* will require, as a condition of consideration for publication, registration of clinical trials in a public trials registry (such as <http://ClinicalTrials.gov> or <http://controlled-trials.com>). Trials must be registered at or before the onset of patient enrollment. This policy applies to any clinical trial starting enrollment after March 1, 2006. For trials that began enrollment before this date, registration will be required by June 1, 2006. The trial registration number should be supplied at the time of submission.

For details about this new policy see the editorials by DeAngelis et al in the September 8, 2004 (2004;292:1363-1364) and June 15, 2005 (2005;293:2927-2929) issues of *JAMA*.