

Maternal Depression and Childhood Health Inequalities

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Abstract

An increasing body of literature documents considerable inequalities in the health of young children in the United States, though maternal depression is one important, yet often overlooked, determinant of children's health. In this article, the author uses data from the Fragile Families and Child Wellbeing Study ($N = 4,048$) and finds that maternal depression, particularly recurrent or chronic depression, puts children at risk of having unfavorable health when they are five years old. This finding persists despite adjusting for a host of demographic characteristics of the mothers and children (including children's prior health) and is consistent across multiple health outcomes. Family instability, maternal health, and socioeconomic status account for the association between maternal depression and children's health. Given that poor childhood health may lead to poor health and low socioeconomic status in adulthood, maternal depression may contribute to the intergenerational transmission of inequality.

Keywords

children's health, Fragile Families, intergenerational transmission of disadvantage, maternal depression

An increasing body of literature documents considerable inequalities in the health of young children in the United States (Aber et al. 1997). These inequalities begin as early as infancy (Braveman et al. 2001) and intensify as individuals progress throughout the life course (Bloom, Cohen, and Freeman 2009). It is well documented that racial minorities, children in single-mother families, and children in poor households experience vulnerabilities with respect to their health status (Bloom et al. 2009). Children in poor households, for example, are more than five times as likely as children in nonpoor families to have parent-reported fair or poor health, creating a large public health burden in already disadvantaged families and communities (Bloom et al. 2009). Because poor health in childhood may lead to poor health and low socioeconomic status in adulthood, it is especially crucial to understand the determinants of early childhood health (Case, Fertig, and Paxson 2005; Haas 2006).

Maternal depression is one important, yet often overlooked, determinant of children's health. However, there is reason to believe that maternal

depression may lead to impairments in young children's health. Symptoms of depression—including fatigue, difficulty concentrating, or losing interest in daily activities—may influence a mother's ability to make and keep doctor's appointments for her children, adhere to treatment regimes for sick children, or notice health problems as they arise. In addition, research consistently finds that depression may increase economic insecurity (Marcotte and Wilcox-Gok 2001), impede union formation or contribute to conflict in already established unions (Kim and McKenry 2002; Teitler and Reichman 2008), and foster additional health problems (Aneshensel, Frerichs, and Huba 1984), all of which are independently linked to health problems

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in children. Indeed, though little research links maternal depression to children's health, a large body of literature suggests that depression among mothers can have other harmful consequences for children. Children of depressed mothers are more likely than other children to have impaired social, behavioral, and cognitive outcomes in infancy, childhood, adolescence, and adulthood (Augustine and Crosnoe 2010; Goodman and Gotlib 2002; Meadows, McLanahan, and Brooks-Gunn 2007; Turney 2011). Though maternal depression is consistently associated with more mental health problems and behavioral problems in young children, we know little about how maternal depression may matter for children's physical health.

Thus, in this article, I examine how maternal depression may be linked to children's health, using data from the Fragile Families and Child Wellbeing Study. The Fragile Families study is a longitudinal, recent cohort of about 5,000 children born in urban areas between 1998 and 2000. I examine how chronic, persistent maternal depression and intermittent or short-term maternal depression may lead to inequalities in five-year-old children's health. The main analyses examine mother-reported general child health, and additional analyses consider specific health conditions (e.g., asthma) and health care utilization (e.g., going to the emergency room). The analyses also adjust for a lagged indicator of child health to better estimate the causal direction of the relationship between maternal depression and children's health. I also extend prior research by examining the mechanisms underlying the association between maternal depression and children's health. In addition, this article contributes to the literature by using a diverse sample of children, many born to unmarried mothers. Understanding the outcomes of children born to unmarried parents is important, as this is an increasing demographic group (Hamilton, Martin, and Ventura 2010), these children may be particularly vulnerable (Sigle-Rushton and McLanahan 2004), and we know little about the consequences of maternal depression for these children (Goodman and Gotlib 2002).

BACKGROUND

Importance of Understanding Child Health

Understanding the correlates of physical health in young children is important because early health inequalities are reproduced throughout the life

course. Some argue that early childhood health sets the stage for school readiness (Padilla, Hamilton, and Hummer 2009), and research shows that poor childhood health is associated with cognitive difficulties (Eide, Showalter, and Goldhaber 2010). In addition, children with health problems experience more school absences than their healthy counterparts and are less likely to be involved in school activities (Blanchard, Gurka, and Blackman 2006). Given that experiences in elementary school place children on a trajectory to experience additional advantages or disadvantages in the educational system, these early health disparities may have implications for stratification across the life course (Entwisle and Alexander 1989). Thus, it is not surprising that poor health in childhood has also been linked to a host of disadvantages in adulthood. Those who experience poor health as children, for example, are likely to have poor health and lower socioeconomic status in adulthood (Case et al. 2005; Haas 2006).

Maternal Depression and Children's Health

The life course perspective has emerged as the dominant framework for understanding human development. This perspective highlights the intergenerational transmission of advantage and disadvantage as well as the interdependence of social relationships; thus, the mental health of mothers may be linked to the well-being of their children (Elder 1998). As discussed earlier, a growing body of literature documents the consequences of maternal depression for children's mental health, including behavioral problems. Among young children, maternal depression leads to both internalizing and externalizing behavior problems (Meadows et al. 2007; Turney 2011).

Though a robust body of literature suggests depression in mothers may lead to mental health problems in their children, researchers have paid less attention to the consequences of maternal depression for children's physical health. Theoretically, there are strong reasons why maternal depression may lead to impairments in child health. Symptoms of depression—including fatigue, difficulty concentrating, or losing interest in daily activities—may influence a mother's ability to make and keep doctor's appointments for her children, notice health problems in children, and adhere to treatment regimes for sick children.

There are several examinations linking maternal depression and child health. Angel and Worobey (1988), in their cross-sectional study of Mexican

children in the Hispanic Health and Nutrition Examination Survey (Hispanic HANES), find that maternal depression is one of the largest predictors of poor health among children ages six months to 11 years. Regional studies come to similar conclusions. One study finds that maternal depression is associated with fair or poor health among children under the age of three, though this study uses a cross-sectional, convenience sample of children visiting hospital clinics or emergency departments (Casey et al. 2004). Evidence from a sample of 150 mostly white, middle- to upper-class children with a family history of asthma shows that asthma diagnoses by age eight are higher in children of depressed mothers (Klinnert et al. 2001). Greater depressive symptoms in mothers are associated with more visits to hospital emergency departments (Bartlett et al. 2004; Minkovitz et al. 2005), more hospitalizations (Casey et al. 2004), and fewer well-child visits (Minkovitz et al. 2005). Thus, though there is evidence that maternal depression may lead to health problems in children, the existing literature is often based on small, cross-sectional, or homogeneous samples of children and does not examine the mechanisms linking maternal depression and children's health.

Children who reside with chronically depressed mothers may be more vulnerable than children of mothers who experience short-term, fleeting depression. When depression is chronic and recurrent, mothers may experience a more persistently stressful and less supportive social context than when depression is intermittent (Turner and Lloyd 1999), which may reduce mothers' capacities to engage in preventive health measures with their children. Research points to the detrimental consequences of chronic maternal depression for children's behavioral outcomes (Turney 2011), and these consequences may extend to children's physical health outcomes. Indeed, other research shows that mothers chronically but not intermittently depressed are more likely to smoke and less likely to have a car seat for their child (Leiferman 2002).

Potential Mechanisms Linking Maternal Depression to Children's Health

Depression may lead to low socioeconomic status, family instability, or less favorable health among mothers, all of which may contribute to poor health outcomes in children. Though these proposed mechanisms are not exhaustive of all pathways,

they provide a useful starting point for understanding the intergenerational transmission of health.

Socioeconomic status. To begin with, there is a robust link between depression or depressive symptoms and socioeconomic status. Though low socioeconomic status may lead to depression (Heflin and Iceland 2009), there is also evidence that depression contributes to low socioeconomic status (Marcotte and Wilcox-Gok 2001). Low socioeconomic status is also associated with less favorable health outcomes in children (Bloom et al. 2009), and employed mothers generally have healthier children (Osborne and Knab 2007). Health insurance may also link maternal depression to children's physical health, as maternal mental illness is associated with a lower likelihood of having private health insurance (Noonan et al. 2010). Health insurance may make it easier to engage in preventive health care for children (Berk and Schur 1998).

Family instability and change. Family instability may be another mechanism through which maternal depression is associated with children's outcomes. A robust literature addresses the consequences of psychological well-being for union formation, documenting that depressed individuals are less likely to form unions and more likely to divorce (Simon 2002). Another body of literature describes the protective effects of marriage for children's physical health (Angel and Worobey 1988; Harknett 2009). Multipartnered fertility and relationship quality are also associated with maternal depression and children's outcomes (Bronte-Tinkew, Horowitz, and Scott 2009; Turney and Carlson 2011; Wade and Pevalin 2004).

Maternal health and health behaviors. Finally, maternal health and health behaviors may mediate the association between maternal depression and child health. Depression is associated with health problems (Aneshensel et al. 1984). Substance use is correlated with depression and children's outcomes (Osborne and Berger 2009), and depression may inhibit a mother's ability to engage in physical activity with her child (Frech and Kimbro 2011).

Additional Correlates of Maternal Depression and Children's Health

Additional individual-level characteristics may render the association between maternal depression and children's health spurious. Race and immigrant status are important correlates of both depression and child health. Black and Hispanic children have

worse general health than white children (Bloom et al. 2009), and children of immigrants have worse physical health than their native-born counterparts (Crosnoe 2006). The association between age and depression is nonlinear (Kessler and Zhao 1999), and children of older mothers may have more favorable health outcomes (Furstenberg, Brooks-Gunn, and Chase-Lansdale 1989). Additional characteristics of the family environment such as number of siblings may be inversely associated with child well-being (Downey 1995). The multivariate analyses also control for whether the child is the mother's first birth, given that first-time mothers likely encounter more challenges in parenting (Cowan and Cowan 1992), as well as whether the mother smoked while pregnant (Fox, Sexton, and Hebel 1990). Child characteristics such as gender and birth weight are known correlates of health (Bloom et al. 2009).

Research Questions

In this article, I examine two research questions. First, what is the relationship between maternal depression over time and five-year-old children's health? Second, to what extent do socioeconomic status, family instability and change, and maternal health and health behaviors explain the association between maternal depression and children's health? The main analyses operationalize children's health as mother-reported general health status. Though adult self-reported health status is considered a valid indicator of well-being and an important predictor of mortality (Idler and Benyamini 1997), much less research examines the validity of parent-reported child health. Some evidence, though, shows parent-reported health is a reliable indicator of well-being. Parent-reported health, for example, is correlated with doctor reports of child health (Case, Lubotsky, and Paxson 2002). Others find that parental reports of child health are associated with health care utilization (Monette et al. 2007), children's functional limitations (Arcia 1998), asthma (Monette et al. 2007), and other acute and chronic medical conditions (Arcia 1998; McCormick et al. 1993). Because depressed mothers may have negative, distorted perceptions of their children, I also consider a series of additional, more objective indicators of health (asthma attack, hay

fever or respiratory allergy, and eczema or skin allergy in the past year) and health care utilization (dentist visit, emergency room visit, and doctor visits due to illness, accident, or injury in the past year) that may be subject to environmental influences.

METHOD

Data

I use data from the Fragile Families and Child Wellbeing Study, a longitudinal survey of nearly 5,000 new and mostly unmarried parents in 20 U.S. cities that were stratified by labor market conditions, welfare generosity, and child support policies (Reichman et al. 2001). Births to unmarried mothers were oversampled and comprise about 76 percent of the initial sample; therefore, the sample overrepresents minority children, economically disadvantaged children, and children with nonresidential fathers. Mothers completed an in-person interview after the birth of their child, between February 1998 and September 2000. Fathers were interviewed as soon as possible after the child's birth. Mothers and fathers were interviewed by telephone when their children were approximately one, three, and five years old. About 86 percent of mothers participated in the baseline interview, and of these, about 90 percent, 88 percent, and 87 percent completed the one-, three-, and five-year surveys, respectively (Bendheim-Thoman Center for Research on Child Wellbeing 2008).

The analytic sample comprises 4,048 observations, as I delete 850 observations missing data on children's general health at the five-year survey (including 91 cases excluded because the child was not living with the mother). Importantly, mothers in the analytic and full samples report similar levels of depression, child health, and most demographic and socioeconomic characteristics. Mothers in the analytic sample have greater educational attainment ($p < .05$).

Measures

Child health. The main analyses consider a measure of general child health. At the one-, three-, and five-year surveys, mothers were asked to rate their

child's general health (poor, fair, good, very good, or excellent). Because relatively few children were in fair or poor health, I collapse these response categories (1 = *fair or poor*, 2 = *good*, 3 = *very good*, 4 = *excellent*). In additional analyses, I examine three specific, more objective indicators of children's health at the five-year survey: asthma attack in the past year, hay fever or respiratory allergies in the past year, and eczema or skin allergies in the past year. I also examine three indicators of health care utilization in the past year: visit dentist for a check-up, visit emergency room, and number of doctor's visits due to illness, accident, or injury. All are dummy variables except for number of doctor's visits, which ranges from 0 to 25.

Maternal depression. Maternal depression is measured with the Composite International Diagnostic Interview Short Form (CIDI-SF; Kessler et al. 1998). Mothers were asked if, at some time during the past year, they had feelings of depression or were unable to enjoy normally pleasurable things. Those who experienced at least one of these two conditions most of the day, every day for a two-week period were asked additional questions (about losing interest in things, feeling tired, experiencing a change in weight of at least 10 pounds, having trouble sleeping, having trouble concentrating, feeling worthless, or thinking about death), and those who answered affirmatively to three or more of these questions are considered depressed. Although limitations to the CIDI-SF exist (Link 2002), it is commonly used in large-scale community surveys. Based on mothers' responses at the one-, three-, and five-year surveys, I create mutually exclusive variables that capture the chronicity of depression: never depressed (reference category), depressed at one time period, depressed at two time periods, and depressed at three time periods.

Socioeconomic status. The multivariate analyses include five indicators of socioeconomic status at the five-year survey. First, a dummy variable indicates the respondent worked during the week prior to the interview. Dummy variables capture educational attainment: less than high school diploma (reference category), high school diploma or GED, and postsecondary education. Income-to-poverty ratio is the ratio of the total household income to the official poverty thresholds established by the U.S. Census Bureau. Mothers were asked if, at

some point in the past 12 months, they experienced certain events because there was not enough money, such as received free food or meals or did not pay the full amount of rent or mortgage. Mothers' answers to these 12 questions were summed to create an indicator of material hardship, with greater values indicating more material hardship. Finally, a series of dummy variables represents children's health insurance status: private health insurance, public health insurance, and no health insurance (reference category).

Family instability and change. The multivariate analyses include seven indicators of family instability and change. First, a series of dummy variables captures the relationship between the child's biological mother and father at the five-year survey: married, cohabiting, and nonresidential or no relationship (reference category). I also control for the number of family structure transitions the child experienced through the five-year survey: no transitions (reference category), one transition, and two or more transitions. Dummy variables indicate the child's mother has a new romantic partner at the five-year survey, the mother has children by more than one partner, and the presence of a new child in the household. Hostility in the current relationship comprises an average of responses to the following questions (0 = *no relationship*, 1 = *never*, 2 = *sometimes*, 3 = *often*): he/she insults or criticizes your ideas; he/she tries to keep you from seeing friends or family; he/she tries to prevent you from going to work or school; and he/she withholds money or tries to take your money ($\alpha = .926$). Finally, number of residential moves the child made through the five-year survey is a continuous variable.

Health and health behaviors. The four indicators of health and health behaviors are measured at the five-year survey. I include a dummy variable indicating the mother reports a serious health problem (defined as asthma, diabetes, high blood pressure, or heart disease) that limits her work, as well as a dummy variable indicating she smoked cigarettes in the past month. I also control for the mother having a substance abuse problem, defined as an affirmative response that drinking, being hungover, or using drugs interfered with school, work, or home in the last 12 months. Finally, I include a variable that captures how many days in a typical week the mother plays outside with her child.¹

Controls. I control for a host of maternal characteristics measured at baseline, ensuring they are as exogenous as possible from the dependent variable and measured prior to depression. Mother's race is represented by a series of dummy variables: white (reference category), black, Hispanic, and other race. A dummy variable indicates the respondent was born outside of the United States. I control for mother's age, a continuous variable, and include a squared term in the multivariate analyses. Dummy variables represent the mother's and father's relationship status at birth: married, cohabiting, and nonresidential or no relationship (reference). Number of children in the household is a continuous variable, and a dummy variable indicates the child was the mother's first birth. I control for several indicators of socioeconomic status, including a series of dummy variables for education (less than high school diploma, [reference category], high school diploma or GED, and postsecondary education), a dummy variable indicating the birth was paid for by Medicaid, and a continuous income-to-poverty ratio. Dummy variables indicate the mother reported fair or poor health and that the mother reported smoking during her pregnancy. Finally, the multivariate analyses include dummy variables indicating the child is male and the child was born with low birth weight (less than 2,500 grams).²

Analytic Strategy

In Table 1, I present descriptive statistics of all variables for the full sample and by the chronicity of maternal depression. The multivariate analyses proceed in three parts. In the first part, in Table 2, I estimate the relationship between maternal depression and children's general health with ordered logistic regression models, which estimate the cumulative probability of being at or below a particular category (e.g., very good health) as a function of the covariates. Ordered logistic regression models are appropriate because higher values indicate more favorable health and because the distance between categories may not be the same. The coefficients can be used to interpret the direction, statistical significance, and magnitude of the relationship between maternal depression and child health. The distance between the health categories is unknown, and the intercepts presented show the

estimated cutpoint of the latent variable used to distinguish the categories (Borooah 2002). I include maternal depression in all ordered logistic regression models. Model 1 presents the unadjusted association between chronicity of maternal depression and child health. Model 2 includes a host of covariates measured at baseline, and Model 3 adds a lagged indicator of child health (measured when children were about one year old). Table 3, which displays predicted probabilities for each of the four categories of child health by maternal depression, is based on estimates from Table 2.

One potential limitation of ordered logistic regression models is that they may be subject to unobserved heterogeneity. Fixed-effects models, which would estimate child health net of time-varying observed characteristics and all time-invariant characteristics, may provide a better opportunity to estimate a causal relationship between maternal depression and child health. However, fixed-effects models would drop all observations in which maternal depression does not change over time (including the chronically depressed and the never depressed), making it impossible to examine the differential effect of chronic and transitory depression. Fixed-effects models also do not have the ability to estimate constant factors such as race. I do, however, include a lagged indicator of child health in the ordered logistic regression models, which is another appropriate way to measure change (Allison 1994).

In the second part of the analyses, presented in Table 4, I estimate six additional indicators of health and health care utilization. I use logistic regression models to predict all outcomes except the number of doctor visits; for this outcome, I use Poisson regression models to account for this variable's skewed distribution. These analyses have two limitations. First, with the exception of asthma, these questions were only asked of the subsample of mothers who participated in the in-home survey. In addition, these questions were only asked at one point in time, making it impossible to adjust for lagged dependent variables.

In the final stage, presented in Table 5, I examine mechanisms that may explain the association between maternal depression and children's health. In this table, models include all covariates from Model 3 of Table 2. Model 1 adjusts for socioeconomic status at

Table 1. Descriptive Statistics of Variables Included in Analyses, Entire Sample and by Maternal Depression

Variable	Weighted		Unweighted					
	Entire Sample		Entire Sample		By Chronicity of Maternal Depression			
	Percentage or M	SD	Percentage or M	SD	Never	One Time Period	Two Time Periods	Three Time Periods
Child health								
General health (y1)								
Fair or poor (%)	2.0		2.8		2.0	3.2*	3.6**	8.7***
Good (%)	11.7		10.4		9.5	10.8	10.4	13.0
Very good (%)	18.9		20.8		20.4	19.8	31.8	24.2
Excellent (%)	67.3		66.0		68.1	66.2	54.2*	54.0***
General health (y5)								
Fair or poor (%)	1.7		2.1		1.4	2.7*	4.8**	5.0***
Good (%)	9.7		9.5		8.4	8.5	11.3	16.1**
Very good (%)	25.0		26.6		25.4	27.1	22.3*	32.3
Excellent (%)	63.7		61.8		64.8	61.8	61.6***	46.6***
Asthma attack in past year (y5) (%)	6.7		8.2		7.5	7.6	8.9	15.5***
Hay fever or respiratory allergies in past year (y5) (%)	13.1		13.1		11.6	13.8	19.4***	22.2***
Eczema or skin allergies in past year (y5) (%)	16.0		16.4		14.5	18.2*	23.1***	30.2***
Dentist in past year (y5) (%)	81.7		80.4		82.7	75.7***	76.9*	77.8
Emergency room in past year (y5) (%)	20.9		23.7		21.5	23.3	29.4**	35.7***
Number of doctor visits in past year (y5)	1.250	2.091	1.244	2.059	1.175	1.327	1.488*	1.754**
Maternal depression chronicity (y1, y3, y5)								
Never depressed (%)	72.9		66.3					
Depressed at one time period (%)	16.0		19.9					
Depressed at two time periods (%)	7.0		9.4					
Depressed at three time periods (%)	4.1		4.5					
Socioeconomic status								
Employed (y5) (%)	58.4		59.6		63.4	55.5***	50.6***	52.2**
Education (y5)								
Less than high school (%)	23.8		26.2		24.3	26.9	26.1	24.4
High school diploma or GED (%)	24.4		21.8		22.3	20.0	21.6	19.4
Postsecondary education (%)	51.8		52.1		53.4	53.1	52.3	56.3
Income-to-poverty ratio (y5)	2.668	3.280	1.965	2.261	2.177	1.726***	1.551***	1.434***
Material hardship (y5)	1.438	1.799	1.849	2.008	1.407	2.237***	3.246***	3.720***
Child health insurance (y5)								
Private (%)	43.5		36.9		41.7	31.2***	26.8***	26.1***
Public (%)	50.7		55.9		51.4	61.5***	67.9***	68.1***
None (%)	5.8		7.2		6.9	7.3	5.3	5.8
Family instability and change								
Relationship with child's father (y5)								
Married (%)	51.5		31.8		36.7	24.8***	23.6***	23.8**

(continued)

Table 1. (continued)

Variable	Weighted				Unweighted			
	Entire Sample		Entire Sample		By Chronicity of Maternal Depression			
	Percentage or M	SD	Percentage or M	SD	Never	One Time Period	Two Time Periods	Three Time Periods
Cohabiting (%)	9.5		13.1		13.2	14.3	11.3	8.8
Nonresidential or no relationship (%)	39.0		55.2		50.1	61.0***	65.1***	67.5***
Number of family structure transitions (b, y1, y3, y5)								
None (%)	56.2		46.1		53.9	47.3**	48.8	44.1*
One (%)	21.0		28.8		30.7	35.2*	35.1	39.8*
Two or more (%)	22.7		25.1		15.3	17.5	16.1	16.1
Mother in new relationship (y5) (%)	18.3		26.2		23.9	29.0**	30.4*	32.3*
Multipartnered fertility (y1, y3, y5) (%)	30.1		41.6		37.6	45.5***	48.1***	53.2***
New child in household (y1, y3, y5) (%)	44.6		39.0		38.8	39.0	38.6	33.1
Conflict in current relationship (y5)	.933	.494	.845	.546	.855	.846	.865	.832
Number of residential moves (y1, y3, y5)	1.009	1.035	1.220	1.078	1.095	1.355***	1.586***	1.553***
Health and health behaviors								
Physical health problem that limits work (y5) (%)	3.0		3.0		2.4	3.4	5.4**	4.3
Smoked in last month (y5) (%)	22.1		29.7		25.6	35.1***	42.0***	46.6***
Substance abuse problem (y5) (%)	.8		1.0		.5	1.4*	3.6***	2.5**
Number of days played outside with child (y5)	3.097	1.903	3.248	1.812	3.296	3.175	3.065*	3.273
Baseline controls								
Race (b)								
White (%)	29.3		21.2		22.0	20.0	25.6	23.8
Black (%)	34.0		48.7		47.0	51.6*	52.7	55.0
Hispanic (%)	29.0		26.5		27.2	25.0	19.6**	17.5**
Other race (%)	7.7		3.6		3.7	3.4	2.1	3.8
Immigrant (b) (%)	26.6		15.1		16.4	11.8**	7.5***	10.6*
Age (b)	27.145	6.244	25.186	6.020	25.422	24.594**	24.426**	25.236
Relationship with child's father (b)								
Married (%)	53.3		24.9		28.2	21.0***	17.9***	19.9*
Cohabiting (%)	22.9		35.9		34.7	36.5	39.3	37.9
Nonresidential or no relationship (%)	23.7		39.3		37.1	42.5**	42.9*	42.2
Number of children in household (b)	2.126	1.304	2.252	1.296	2.217	2.305	2.367*	2.248
Mother's first birth (b) (%)	40.3		38.8		40.1	38.5	36.6	29.2**
Education (b)								
Less than high school (%)	28.2		33.0		31.0	34.8	34.8	30.0
High school diploma or GED (%)	31.6		31.0		30.9	31.7	30.6	30.6
Postsecondary education (%)	40.3		36.0		38.2	33.4*	34.5	39.4

(continued)

Table 1. (continued)

Variable	Weighted		Unweighted					
	Entire Sample		Entire Sample		By Chronicity of Maternal Depression			
	Percentage or M	SD	Percentage or M	SD	Never	One Time Period	Two Time Periods	Three Time Periods
Birth paid for by Medicaid (b) (%)	53.9		61.1		59.0	62.9	62.9	59.6
Income-to-poverty ratio (b)	3.188		2.280	2.444	2.484	2.112***	1.832***	1.831**
Fair or poor health (b) (%)	7.1		7.3		5.0	11.2***	10.1***	11.9***
Prenatal smoking (b) (%)	11.7		18.6		15.1	23.2***	28.4***	25.5***
Child is male (b) (%)	57.1		52.6		52.9	48.5*	56.8	52.2
Child born low birth weight (b) (%)	7.6		9.4		9.0	11.3	7.4	8.9
N	4,048		4,048		2,380	715	336	161

Note: Sample sizes across groups do not sum to the total N (4,048) because of missing data on maternal depression. Asterisks compare never depressed mothers to all other groups of mothers. b = measured at baseline survey; y1 = measured at one-year survey; y3 = measured at three-year survey; y5 = measured at five-year survey.

* $p < .05$. ** $p < .01$. *** $p < .001$.

the five-year survey, Model 2 adjusts for family instability and change, and Model 3 adjusts for maternal health and health behaviors. The last model includes all potential mechanisms.

Because observations are clustered within 20 cities, I use clustered standard errors and city fixed-effects in all models. I present weighted and unweighted descriptive statistics. The multivariate estimates do not use survey weights because I adjust for all variables used in creating the weights (race/ethnicity, education, marital status, and age), though multivariate results are robust when using the survey weights. All control variables are missing fewer than 3 percent of observations, and I use the `ice` command in Stata to impute missing data (Royston 2004). I produce 10 data sets and in the imputation model include all variables used in the analyses (Allison 2002).

Sample Description

I present descriptive statistics in Table 1. About 64 percent of children in the weighted analytic sample are in excellent health at the five-year survey, 25 percent are in very good health, 10 percent are in good health, and 2 percent are in fair or poor health. With respect to specific health conditions, about 7 percent of children had an asthma attack, 13 percent had hay fever or respiratory allergies, and 16 percent had eczema or skin allergies in the

past year. Notably, more than 27 percent of children in the weighted analytic sample have a mother who reported at least one episode of depression during the first five years of their lives. The majority of mothers in the weighted analytic sample are minorities; about 34 percent are black, 29 percent are Hispanic, and 8 percent are other race. About 27 percent of mothers are foreign-born. They are 27 years old, on average, at the birth of the focal child, and about 40 percent are first-time parents. About 60 percent did not receive education beyond high school, and about 54 percent of births were paid for by Medicaid.

Table 1 displays sharp differences in five-year-old children's health by the chronicity of maternal depression. When mothers experience chronic depression (i.e., report depression at the one-, three-, and five-year surveys), their children are more likely than children of never depressed mothers to be in fair or poor health (5 percent, compared to 1 percent) and less likely to be in excellent health (47 percent, compared to 65 percent). Children of chronically depressed mothers, compared to their counterparts with never depressed mothers, are about twice as likely to have had an asthma attack, hay fever or respiratory allergies, or eczema or skin allergies in the past year. Children's health also suffers when their mothers report depression that is recurrent (reported at one or two time periods) but not chronic.

Table 2. Ordered Logistic Regression Models Estimating Five-Year-Old Children's General Health as a Function of Maternal Depression

Variable	Model 1		Model 2		Model 3	
Maternal depression						
Never depressed (reference)	—	—	—	—	—	—
Depressed at one time period	-.229	.117	-.121	.123	-.094	.127
Depressed at two time periods	-.427	.168*	-.397	.175*	-.331	.161*
Depressed at three time periods	-.805	.155***	-.746	.184***	-.564	.194***
Covariates						
Race (b)						
White (reference)			—	—	—	—
Black			-.058	.196	-.027	.208
Hispanic			-.269	.295	-.109	.309
Other race			.580	.339	.656	.396
Immigrant (b)			-.817	.200***	-.723	.208***
Age (b)			-.001	.042	.030	.047
Age squared (b)			-.001	.001	-.001	.001
Relationship with child's father (b)						
Married			.102	.134	.021	.154
Cohabiting			-.123	.091	-.145	.101
Nonresidential or no relationship (reference)			—	—	—	—
Number of children in household (b)			-.012	.065	-.006	.064
Mother's first birth (b)			.277	.112*	.218	.122
Education (b)						
Less than high school (reference)			—	—	—	—
High school diploma or GED			.133	.134	.025	.149
Postsecondary education			.457	.133**	.372	.147**
Birth paid for by Medicaid (b)			-.172	.105	-.152	.116
Income-to-poverty ratio (b)			.107	.055*	.093	.062
Fair or poor health (b)			-1.062	.155***	-.777	.146***
Prenatal smoking (b)			.344	.148*	.253	.158
Child is male (b)			-.350	.103**	-.275	.104**
Child born low birth weight (b)			-.585	.150***	-.307	.150*
Child health (y1)					.678	.077***
Intercepts						
1			-7.142	-7.679	-4.519	
2			-4.047	-4.551	-1.352	
3			-2.225	-2.643	.647	
N			4,048	4,048	4,048	

Note: All models include city fixed-effects and use robust standard errors. b = measured at baseline survey; y1 = measured at one-year survey; y3 = measured at three-year survey; y5 = measured at five-year survey.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Both chronic and recurrent depression is associated with additional disadvantages for mothers and children. Children of never depressed mothers, compared to their counterparts with mothers who

report at least one episode of depression, have a greater income-to-poverty ratio, experience less material hardship, and are more likely to have private health insurance at the five-year survey. These

Table 3. Predicted Probabilities of Five-Year-Old Children's General Health by Maternal Depression, Estimated from Table 2

	Model 1	Model 2	Model 3
Never depressed			
Fair or poor	.001	.001	.000
Good	.016	.013	.011
Very good	.078	.066	.063
Excellent	.905	.921	.923
Depressed at one time period			
Fair or poor	.001	.001	.001
Good	.021	.016	.013
Very good	.098	.084	.076
Excellent	.880	.899	.910
Depressed at two time periods			
Fair or poor	.001	.001	.001
Good	.027	.021	.016
Very good	.123	.105	.091
Excellent	.849	.873	.892
Depressed at three time periods			
Fair or poor	.002	.001	.001
Good	.035	.027	.020
Very good	.151	.131	.108
Excellent	.813	.840	.871

Note: Predicted probabilities presented for first imputed data set.

children also experience more stability in their familial environment (i.e., fewer family structure transitions and residential moves) and their mothers are less likely to smoke or have a substance abuse problem.

RESULTS

Children's General Health as a Function of Maternal Depression

The prior table suggests inequalities in children's general health by maternal depression. These descriptive differences may be driven by additional factors associated with children's health or maternal depression, which I consider in Table 2. In Model 1, the difference in health between children of never depressed mothers and children of mothers depressed at one time period is only marginally significant ($p < .10$). However, when mothers report depression at two or three time periods, compared to when mothers never report depression, children have worse health. Depression at two points in time is associated with

0.652 ($\exp^{-.427}$) times the odds of rating children's health above a given category ($p < .05$). When mothers are depressed at three points in time, they have .447 times the odds of rating children's health above a given category ($p < .001$). In Model 2, which accounts for a host of covariates, the coefficients for maternal depression at two and three time periods remain statistically significant. The final model, the most rigorous test of this association, includes covariates from Model 2 and a lagged indicator of children's health.³ Compared to children of never depressed mothers, children of mothers who report depression at two time periods (OR = .718, $p < .05$) or three time periods (OR = .569, $p < .001$) have worse health. Table 3 shows that the predicted probability of being in excellent health is .923 for children of never depressed mothers and .871 for children of chronically depressed mothers.

The models in Table 2 compare children of never depressed mothers to all other groups of children. When I rotate the reference category (results not shown), I find chronic depression is especially detrimental to children's health. In the full model,

Table 4. Logistic and Poisson Regression Models Estimating Five-year-old Children's Health and Health Care Utilization as a Function of Maternal Depression

Variable	Model 1		Model 2	
Asthma attack in past year ($n = 4,048$)				
Never depressed (reference)	—	—	—	—
Depressed at one time period	.079	.130	.040	.137
Depressed at two time periods	.208	.166	.158	.179
Depressed at three time periods	.714	.247**	.666	.248**
Hay fever or respiratory allergy in past year ($n = 2,959$)				
Never depressed (reference)	—	—	—	—
Depressed at one time period	.198	.146	.290	.158
Depressed at two time periods	.562	.162**	.636	.177***
Depressed at three time periods	.728	.284*	.805	.291**
Eczema or skin allergy in past year ($n = 2,958$)				
Never depressed (reference)	—	—	—	—
Depressed at one time period	.154	.121	.127	.113
Depressed at two time periods	.441	.112***	.400	.128**
Depressed at three time periods	.734	.202***	.703	.215**
Dentist for regular check-up in past year ($n = 2,949$)				
Never depressed (reference)	—	—	—	—
Depressed at one time period	-.393	.121**	-.328	.129*
Depressed at two time periods	-.350	.147*	-.259	.150
Depressed at three time periods	-.279	.279	-.178	.285
Emergency room visit in past year ($n = 2,955$)				
Never depressed (reference)	—	—	—	—
Depressed at one time period	.139	.110	.058	.117
Depressed at two time periods	.386	.117**	.294	.106**
Depressed at three time periods	.654	.234**	.550	.224*
Number of doctor's visits in past year due to illness, accident, or injury ($n = 2,958$)				
Never depressed (reference)	—	—	—	—
Depressed at one time period	.079	.064	.091	.054
Depressed at two time periods	.174	.090	.140	.093
Depressed at three time periods	.354	.191	.334	.181

Note: All models include city fixed-effects and use robust standard errors. Poisson regression models estimate the number of doctor's visits in the past year, and logistic regression models estimate the other outcomes. Model 2 includes all variables from Model 1 of Table 2.

* $p < .05$. ** $p < .01$. *** $p < .001$.

children of chronically depressed mothers have worse health than children of mothers depressed at one time period (-0.472 , $p < .05$). Children are also disadvantaged when mothers report depression at two time periods. These children have worse health than children of never depressed mothers ($-.332$, $p < .05$) and have similar health as when mothers are chronically depressed ($-.256$, *n.s.*). Supplemental analyses also show that the timing of depression is not associated with children's health independently of depression chronicity. Also, there

is no evidence the association between maternal depression and children's health varies by mother's education, poverty status, or marital status at birth (results not shown).

Robustness of Association between Children's Health and Maternal Depression

In Table 4, I present estimates for additional health and health care utilization outcomes. Turning first

Table 5. Ordered Logistic Regression Models Estimating Five-Year-Old Children's General Health as a Function of Maternal Depression and Mechanisms

Variable	Model 1		Model 2		Model 3		Model 4	
Maternal depression chronicity								
Never depressed (reference)	—	—	—	—	—	—	—	—
Depressed at one time period	-.043	.129	-.033	.128	-.087	.127	.010	.127
Depressed at two time periods	-.204	.169	-.263	.153	-.297	.156	-.143	.157
Depressed at three time periods	-.405	.206	-.515	.205*	-.542	.201**	-.374	.219
Child health (y1)	.672	.077***	.672	.078***	.670	.075***	.665	.076***
Socioeconomic status								
Employed (y5)	.057	.142					.048	.148
Education (y5)								
Less than high school (reference)	—	—					—	—
High school diploma or GED	-.348	.267					-.399	.279
Postsecondary education	-.021	.214					-.039	.214
Income-to-poverty ratio (y5)	.080	.062					.066	.058
Material hardship (y5)	-.080	.024**					-.075	.027**
Child health insurance (y5)								
Private	-.154	.196					-.152	.211
Public	-.362	.178*					-.320	.182
None (reference)	—	—					—	—
Family instability and change								
Relationship with child's father (y5)								
Married			.238	.186			.131	.200
Cohabiting			-.219	.223			-.327	.220
Nonresidential or no relationship (reference)			—	—			—	—
Number of family structure transitions (b, y1, y3, y5)								
None (reference)			—	—			—	—
One			.048	.191			.039	.185
Two or more			-.086	.133			-.101	.140
Mother in new relationship (y5)			-.332	.144*			-.403	.138**
Multipartnered fertility (y1, y3, y5)			-.039	.136			-.012	.142
New child in household (y1, y3, y5)			-.181	.132			-.111	.139
Conflict in current relationship (y5)			.057	.152			.096	.153
Number of residential moves (y1, y3, y5)			-.090	.048			-.064	.052
Health and health behaviors								
Physical health problem that limits work (y5)					-.667	.182***	-.607	.195**
Smoked in last month (y5)					-.084	.114	-.001	.127
Substance abuse problem (y5)					-.088	.359	.058	.392
Number of days played outside with child (y5)					.048	.027	.050	.026

(continued)

Table 5. (continued)

Variable	Model 1	Model 2	Model 3	Model 4
Intercepts				
1	-5.019	-5.244	-4.481	-5.493
2	-1.846	-2.071	-1.307	-2.309
3	.167	-.062	.699	-.282
N	4,048	4,048	4,048	4,048

Note: All models include city fixed-effects and use robust standard errors. All models include all variables from Model 3 of Table 2. *b* = measured at baseline survey; *y*1 = measured at one-year survey; *y*3 = measured at three-year survey; *y*5 = measured at five-year survey. **p* < .05. ***p* < .01. ****p* < .001.

to the three health outcomes, results are generally consistent with estimates of mother-reported general health. Adjusting for baseline characteristics, children of mothers depressed at two time periods are more likely to have had hay fever or a respiratory allergy (OR = 1.889, *p* < .001) and eczema or a skin allergy (OR = 1.492, *p* < .01) than their counterparts with never depressed mothers. When mothers are chronically depressed, children are more likely to have had an asthma attack (OR = 1.946, *p* < .01), a respiratory allergy (OR = 2.237, *p* < .01), and a skin allergy (OR = 2.020, *p* < .01).

I turn next to the three health care utilization outcomes. Children of mothers depressed at one time period, compared to their counterparts with never depressed mothers, are less likely to have been to the dentist for a regular check-up in the past year. The coefficient for maternal depression at two time periods is only marginally statistically significant and, contrary to expectations, children of chronically depressed mothers and never depressed mothers are equally likely to have gone to the dentist. Children of mothers depressed at two or three survey waves are more likely to have gone to the emergency room in the past year, and the association between maternal depression and doctor visits is only marginally significant.

I perform two additional robustness checks. First, I substitute maternal reports of children's general health with paternal reports of children's general health. Given that nonresidential fathers likely have different perspectives on children's health than residential fathers or mothers, I restrict this analysis to children with coresidential parents and nonmissing data on paternal reports of children's health at the five-year survey (*n* = 1,619). These reports of children's health are not a perfect substitute for maternal reports, as mothers' and fathers' reports of children's

health are only moderately correlated (*r* = .238). Interestingly, the correlation is stronger for depressed mothers (*r* = .265) than nondepressed mothers (*r* = .233). In the final model, maternal depression at two points in time is associated with worse father-reported health in children (-.478, *p* < .01). The association between chronic maternal depression and father-reported general health in children falls below statistical significance, though this is likely an artifact of the reduced sample size (only 49 mothers are in this category) because the magnitude of the coefficient is similar to the prediction of mother-reported health.

Finally, it is possible that having a child with health problems may lead to depression in mothers. I address this in Table 2 by including a lagged indicator of children's health. In addition, in supplemental analyses, I estimate maternal depression at the five-year survey as a function of children's health at the three-year survey. Net of demographic controls, children's health is inversely associated with maternal depression; worse health in children is associated with a greater likelihood of depression among mothers (*p* < .01). However, this association disappears after adjusting for a lagged indicator of depression, suggesting children's health problems do not lead to depression.

Mechanisms Underlying Association between Maternal Depression and Children's Health

The analyses presented in Tables 2, 3, and 4, as well as a series of robustness checks not presented, suggest that maternal depression, especially chronic depression, is associated with impaired health in children. The next set of analyses, presented in Table 5, considers the mechanisms

linking maternal depression and children's health. Accounting for five-year socioeconomic status in Model 1 completely attenuates the negative consequences of depression. Compared to the final model in Table 2, the coefficients for depression at two and three time periods, respectively, decrease by 38 percent and 28 percent. Maternal depression at two or three time periods is no longer significantly associated with children's health. The next two models adjust for family instability and maternal health. Both sets of mechanisms attenuate the coefficient for depression at two time periods. However, these proposed mechanisms do little to attenuate the link between chronic maternal depression and children's health, reducing this coefficient by only 9 percent (family instability) and 4 percent (health). The final model, which includes all possible mechanisms, shows no statistically significant association between maternal depression, even chronic maternal depression, and child health. Combined, the mechanisms explain 57 percent of the effect of depression at two time periods and 34 percent of the effect of depression at three time periods.

DISCUSSION

I use data from the Fragile Families survey, a birth cohort of children born in urban areas between 1998 and 2000, to examine the link between maternal depression and children's health at the beginning of elementary school, a period in the life course repeatedly linked to future life course trajectories. The first goal of the article was to document the association between maternal depression over time and children's health. Consistent with a life course perspective that highlights the interdependency of parents and children, as well as how an accumulation of disadvantages may render children vulnerable, I find that maternal depression, particularly depression that is recurrent or chronic, puts children at risk of having unfavorable health when they are five years old. This finding persists despite accounting for a host of characteristics of the mothers and children, as well as adjusting for a lagged indicator of children's health. However, when maternal depression is short-lived, children's health does not suffer.

The association between maternal depression and children's health is consistent across a variety

of health outcomes and is robust to several different model specifications, which strengthens the argument that maternal depression may render children vulnerable. When mothers experience persistent depression, children are more likely to have asthma, hay fever or respiratory allergies, and eczema or skin allergies. Results also provide some evidence that children of depressed mothers are less likely to receive preventive care (e.g., a dentist visit in the past year) and more likely to receive acute care (e.g., going to the emergency room). Children of chronically depressed mothers are not more or less likely to go to the doctor because of an illness, accident, or injury. Though children of depressed mothers are more likely to experience health conditions that may warrant a doctor's visit (e.g., asthma or allergies), depression may impair a mother's ability to take her child to the doctor.

Taken together, these findings are consistent with a growing body of literature that suggests wide-ranging consequences of maternal depression for child well-being. Prior research has found maternal depression to be a risk factor for young children's mental health (Goodman and Gotlib 2002; Turney 2011), and I find similar patterns with respect to children's physical health. These findings are also consistent with other research that documents an association between maternal depression and children's health (Angel and Worobey 1988; Casey et al. 2004). In addition, the fact that chronic or recurrent maternal depression is more harmful than short-lived, episodic depression for children's general health is consistent with other research suggesting detrimental effects of chronic depression for children (Turney 2011).

There are many reasons to expect why maternal depression may influence children's health, as discussed earlier, and a second goal of this article was to examine the mechanisms underlying this association. I find that socioeconomic status at the five-year survey, net of baseline socioeconomic status, accounts for a large portion of the association between maternal depression and children's health. Given that socioeconomic status is linked to both depression and children's health (Case et al. 2002; Marcotte and Wilcox-Gok 2001), it is not surprising that socioeconomic status is one pathway through which maternal depression influences children. Depression may hinder a mother's ability to maintain a steady income, and this financial

insecurity may impede a mother's ability to provide her child care for acute or chronic conditions.

Family instability and maternal health and health behaviors attenuate the association between recurrent but not chronic depression and children's health. Depression may destabilize partner relationships (Simon 2002), and family instability may undermine child health (Angel and Worobey 1988). Similarly, mothers coping with their own health conditions may be less attuned to problems in their children or may be unable to engage in health-promoting behaviors with their children. These mechanisms, though, do not independently ameliorate the negative consequences of chronic depression. Perhaps the origins of depression and family instability, of which a thorough examination is beyond the scope of this article, are similar, and thus accounting for instability only marginally diminishes the already deleterious consequences of depression. Future research would benefit from examining the upstream factors associated with depression among mothers of young children. Also, given that the three sets of mechanisms examined are not exhaustive, future research would benefit from exploring additional mechanisms such as social support or parenting behaviors.

Several limitations exist, including shortcomings regarding the measurement of some variables. The dichotomous measure of depression does not allow for the possibility of examining mothers who do not meet the criteria for major depressive disorder but still exhibit some symptoms of depression (Mirowsky and Ross 2002). In addition, it is possible depressed mothers have distorted, negative views of their children's health. The use of additional, more objective indicators of health partially guards against, but does not eliminate, this problem. Finally, as discussed earlier, these analyses are subject to unobserved heterogeneity and do not provide causal conclusions about the effect of maternal depression on children's health.

Despite these limitations, this article contributes to a growing body of literature on the consequences of maternal depression for children and families. To begin with, to my knowledge, this is one of the first studies to use a large, diverse sample of mothers and their children to examine the link between maternal depression and children's health. In addition, the longitudinal data allow me to examine both chronic and transitory depression

and to address the potential endogeneity between depression and child health by adjusting for a lagged indicator of child health in the analyses. Finally, this article contributes to the existing literature by examining mechanisms linking maternal depression to child health. Findings suggest maternal depression has detrimental consequences for the health of five-year-old children, and these inequalities may become more pronounced as children age (and experience the onset of additional health problems and persistence of chronic conditions). Given that poor childhood health may lead to additional disadvantages throughout the life course, such as difficulty progressing through the educational system and reduced socioeconomic status in adulthood, maternal depression may contribute to the intergenerational transmission of inequality.

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NOTES

1. It is possible that some of the mechanisms (e.g., income-to-poverty ratio) are endogenous to maternal depression. However, because the indicator of depression is cumulative—capturing depression when children are about one, three, and five years old—the mechanisms, in many cases, are measured after the mother reports depression. If endogeneity exists, the mechanisms underlying the association between maternal depression and children's health may be overestimated.
2. Children's mental health may be associated with their general health. Thus, in supplemental analyses not

presented, I control for maternal reports of children's internalizing and externalizing behaviors. Including these behaviors does not attenuate the association between maternal depression and children's general health, so I omit these indicators in the models presented because they are only available for a subset of children.

- In supplemental analyses, I instead use an indicator of child health measured temporally closer to the outcome variable, when children are about three years old. These results are consistent with those presented in Table 2.

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Bio

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