Published in final edited form as:

Demography. 2018 December ; 55(6): 2229–2255. doi:10.1007/s13524-018-0730-3.

Maternal Age and Child Development

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Abstract

Although the consequences of teen births for both mothers and children have been studied for decades, few studies have taken a broader look at the potential payoffs—and drawbacks—of being born to older mothers. A broader examination is important given the growing gap in maternal ages at birth for children born to mothers with low and high socioeconomic status. Drawing data from the Children of the NLSY79, our examination of this topic distinguishes between the value for children of being born to a mother who delayed her first birth and the value of the additional years between her first birth and the birth of the child whose achievements and behaviors at ages 10–13 are under study. We find that each year the mother delays a first birth is associated with a 0.02 to 0.04 standard deviation increase in school achievement and a similar-sized reduction in behavior problems. Coefficients are generally as large for additional years between the first and given birth. Results are fairly robust to the inclusion of cousin and sibling fixed effects, which attempt to address some omitted variable concerns. Our mediational analyses show that the primary pathway by which delaying first births benefits children is by enabling mothers to complete more years of schooling.

Keywords

Child development; Maternal age; Fertility; Child achievement

Introduction

Although the consequences of teen births for both mothers (Haveman et al. 1997) and children (Angrist and Lavy 1996; Francesconi 2008; Hoffman 2008; Levine et al. 2001) have been studied for decades, few studies have taken a broader look at the potential payoffs —and drawbacks—of being born to older mothers (for a recent exception, see Addo et al. 2016). A more comprehensive examination is warranted given that the recent reductions in U.S. teen birth rates have masked a growing gap in maternal age at birth for children born to high– and low–socioeconomic status (SES) mothers. Figure 1 uses Natality Detail File data for 50 % to 100 % of all births (based on state of birth) between 1970 and 2010 to show age of mother by maternal schooling. Despite a narrowing since 2000, the maternal age gap

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between children born to high school dropout and college graduate mothers between 1970 and 2010 grew by 2.5 years, from 4.3 years to 6.8 years. Using data from the Panel Study of Income Dynamics (PSID), Duncan et al. (2017) showed that the maternal age gap between the top and bottom quintiles of the income distribution (measured when children were ages 14–16) grew by nearly five years between cohorts of children born in the late 1950s and the early 1980s. In their accounting of the increases in the completed schooling gap between high- and low-income children over this interval, Duncan et al. (2017) found that mother's age at the birth of the children can explain approximately one-quarter of the increase—much more than the rise of single-parent family structures among low-income families.

Delaying a first birth beyond the teen years enables mothers to complete more schooling, begin a career, and acquire a host of other experiences that might contribute to a healthier prenatal environment as well as a wealthier, safer, and more stimulating postnatal environment for their first children (Haveman et al. 1997; Hotz et al. 2005; Augustine et al. 2015; Miller 2011). These same advantages plus those associated with "on-the-job training" lessons from experiences rearing firstborn children may accrue to delays in second and subsequent births. The goal of our study is to analyze the empirical relationship between maternal age and child's human capital, distinguishing between the value of being born to a mother who delayed her first birth and the value of the additional years between the first birth and the focal child. Although some of these advantages may stem from being born to older fathers (Mare and Tzeng 1989), our analyses focus on mothers' ages.

Parents draw on their human capital stocks—determined largely by educational experiences—but also their socioemotional and personality skills—including maturity, experience, self-esteem, and mental health—to foster their children's development. The educational and financial resources associated with higher levels of maternal human capital benefit their children. In contrast, mothers with lower levels of human capital must rely more on their noncognitive skills to promote healthy child development. Because mental health improves across the life course (Kessler et al. 2005) and maturity develops with age, older mothers may also have higher levels of socioemotional skills than younger mothers.

Mothers' human capital and socioemotional skills may complement one another in the production of healthy child development, which may be a particular benefit to mothers who delay childbearing. For instance, it may take a mature or patient mother to transmit her high human capital to her children most effectively. Similarly, maturity or experience could be the key ingredient in shaping high human capital mothers' decisions about other types of investments in children. Augustine et al. (2015) showed that older age at first birth was associated with higher math and reading test scores among the children of college-educated women but not their less-educated counterparts; this is because college-educated mothers, but not other mothers, increased in both income and cognitive support for children with age.

To examine the relationship between children's human capital and maternal age, we draw on data from the Children of the NLSY79 to estimate the value for children of being born to a mother who delayed her first birth. The value of the additional years between her first birth and the birth of the child whose achievements and behaviors at ages 10–13 are under study. Controlling for a rich set of child, mother, and family background characteristics, we find that each year the mother delays a first birth is associated with a 0.02 to 0.04 standard deviation increase in school achievement and a similar-sized reduction in behavior problems at ages 10–13. Coefficients are nearly as large for additional years between the first and given birth. The results for our three outcomes are fairly robust to the inclusion of cousin and sibling fixed effects, which attempt to address some endogeneity concerns. Moreover, and somewhat surprisingly, we find that these associations are roughly linear through the range of maternal ages represented in the sample.

Background

Maternal Age and Child Outcomes

Maternal age at childbirth has been shown to correlate positively with numerous child outcomes even after accounting for maternal covariates, such as maternal education, income, and race. Children's outcomes include learning and educational attainment; financial independence from public programs, such as welfare, food stamps, and Medicaid; (reduced) teen pregnancy; and adolescent and young adult problem behaviors, such as fighting, truancy, and sexual activity (Addo et al. 2016; Augustine et al. 2015; Bradbury 2011; Hardy et al. 1997; Haveman et al. 1997; Hoffman 1998; Levine et al. 2001; Miller 2011). Teen parenthood may be especially detrimental to children's human capital accumulation and their long-term outcomes (Addo et al. 2016; Furstenberg 2007; Moore et al. 1997). Conversely, Addo et al. (2016), relying on data from the Children of the NLSY79 (as we do in our study), suggested that the most important distinction for offspring in predicting their graduation from high school is being born to a mother aged 25 or older.

Advanced Maternal Age and Child Outcomes

An alternative thesis is that the relationship between parental age and child development demonstrates an inverse U-shape and thus turns negative at advanced maternal ages. Older parents may be in poorer physical condition than younger parents or may dedicate less time to parenting given their higher opportunity cost of time in the form of a higher market wage (Leigh and Gong 2010). Mirowsky (2002) related the health of U.S. adults to age at first birth and suggested that maternal health (as measured by such factors as perceived health, energy and fitness, and chronic conditions) is at its peak for mothers who had a first birth around age 30.5 (see also Mirowsky 2005). Older mothers also have a shorter time span in which to bear multiple children, and children might be negatively affected by a reduction in birth spacing, as Buckles and Munnich (2012) demonstrated using an instrumental variables approach exploiting the random variation in birth spacing induced by miscarriage.[1]

Biological aging could also negatively affect offspring development in the short and long run through physiological factors, such as diminished maternal health (particularly during

[1]Buckles and Munnich (2012) used data from the CNLSY79 to study the relationship between birth spacing and child development. Our study also uses the CNLSY79 but addresses a different but related research topic. Specifically, we study the relationship between maternal age at birth and children's human capital differentiating between (1) the value for children of being born to a mother who delayed her first birth (general experience) and (2) the value of the additional years between her first birth and the birth of the child whose outcomes are under study (parenting or child-specific experience). In spite of different sampling restrictions with the same data set, we are able to closely replicate the OLS results from Buckles and Munnich (2012) for child reading outcomes but no math outcomes. These results are available upon request from the authors.

conception, gestation, and birth) or increased rates of genetic disorders (Myrskylä and Fenelon 2012). Using data from the U.S. Health and Retirement Survey, Myrskylä and Fenelon (2012) showed that offspring born to mothers younger than age 25 or older than 35 have worse outcomes with respect to mortality, self-rated health, height, obesity, and the number of diagnosed conditions than children born to mothers aged 25–34. Children born to older mothers are more likely to lose their mothers sooner, and this too may affect those children's health and attainments (Case et al. 2004). Finally, a wider age gap between older parents and their children may have a negative effect on the parent-child relationship, particularly during the child's adolescence (Heuvel 1988).

Methodological Concerns

Many early studies in this area were compromised by selection bias problems, but a number of studies using more rigorous empirical methods suggested a plausibly causal role of mothers' age at birth and at least some dimensions of children's development, although these studies produced mixed findings, and most focused only on the effects of young maternal age. Using a family fixed-effects model, Angrist and Lavy (1996) found that the children of teen mothers are far more likely to repeat one or more grades than the children of older mothers: grade retention is a strong predictor of later outcomes, such as school dropout and poorer cognitive skills. However, Geronimus et al. (1994) and Turley (2003) controlled for time-invariant family characteristics of authors. the teen mothers by comparing cousins whose mothers are sisters and found little evidence that teen childbearing has negative consequences on early childhood cognitive and behavioral development.

Natural experiments have also been used to measure the socioeconomic consequences of teen childbearing. Grogger and Bronars (1993) approximated the effect of a single birth by measuring the effect of increasing the number of teen births from one to two, comparing teen mothers with a singleton birth to those with a twin birth. They found lower rates of high school graduation and labor force participation as well as increased risks of poverty and welfare receipt among black teen mothers; they also found higher poverty and welfare receipt as well as decreasing earnings and incomes among white teen mothers. Hotz et al. (2005) used an instrumental variables approach by comparing women who gave birth as teens with women who miscarried as teens, under the assumption that miscarriages are random. They found that most negative impacts on teen mothers found in previous research were overstated and/or short-lived and that teen childbirth actually had a positive effect on work hours and earnings. However, reanalyzing data from Hotz et al. (2005), Hoffman (2008) found that the positive impacts found among teens born in the early 1970s were overstated and that teen childbearing had a negative effect on teen mothers born in the late 1970s and early 1980s.

In contrast to focusing on teen childbearing, Miller (2011) studied the effects of motherhood delay on children's cognitive development using three biological fertility shocks as instrumental variables: (1) whether the first pregnancy resulted in a miscarriage, (2) whether the mother was using a contraceptive method at the time of conception of the first child, and (3) the time that elapsed from first conception attempt to first birth. One potential concern in using these variables as instruments is that they could be correlated with unobserved attitudes, beliefs, or behaviors of the mother and, if correlated with children human capital, they could violate the exogeneity condition. Miller (2011) provided some evidence that the instruments are uncorrelated to religious affiliation or activities and career outcomes prior to motherhood; however, this evidence does not rule out the concern of unobserved factors. Miller found that delaying motherhood by one year leads to a 0.02–0.03 standard deviation increase in children’s test scores—results that are very similar to those obtained in this study using different methods.

Mediating Mechanisms: Maternal Age and Maternal Human Capital

A positive causal relationship between maternal age and their children’s development could be a function of mothers’ increased human capital. Younger parents may lose the opportunity to invest in their own human capital development if parenthood—and particularly the birth of the first child—limits educational attainment or interrupts labor market participation. Younger parents are also likely to have fewer financial resources: income generally increases over the life course until it reaches a plateau in later adulthood (Featherman et al. 1988; Ross and Mirowsky 1999), and teen childbirth in particular is associated with lower parental earnings and higher rates of poverty (Maynard 1997). A lack of financial preparedness means that young parents may not make optimal decisions about their children’s early education and care, health care usage, and other human capital investments (Leigh and Gong 2010).

Given that delayed childbearing may enable mothers to complete more schooling, it is important to note that an emerging body of literature points to the (plausibly causal) role of parental education in shaping child development (for a summary, see Salvanes and Bjorklund 2010). First, more years of parental education produces higher earnings and increased family incomes, which enables parents to provide better childcare and more stimulating home environments for their young children; live in safer, more-affluent neighborhoods with better schools; and pay for children’s college educations. Second, more highly educated parents adopt different child socialization strategies than their less-educated counterparts. They spend more time—and more “developmentally effective” time—with their children (Bianchi et al. 2004, Guryan et al. 2008; Kalil et al. 2012), produce more cognitively stimulating home learning environments (Harris et al. 1999), have higher expectations for their children’s educational attainment (Davis-Keane 2005), and are more likely to adopt parenting strategies that promote achievement (Steinberg et al. 1992). Skills acquired through schooling may enhance parents’ abilities to organize their daily routines and resources in a way that enables them to accomplish their parenting goals effectively (Michael 1972).

Finally, family instability and single parenthood among younger parents may drive poorer child outcomes: children of young parents face an increased likelihood of growing up fatherless, and teen marriages tend to be more unstable than marriages begun at older ages (Maynard 1997; Turley 2003). For example, Francesconi (2008) employed a family fixed-effects model and found that the children of young parents in nonintact families fare worse along a range of young adult outcomes than those of older parents, whereas the children of young parents in intact families exhibit only slightly poorer outcomes than those of older parents.

Mediating Mechanisms: Maternal Age and Socioemotional Skills

Mental health improves over the life course, and maturity develops over time. Depression decreases with age as adolescents enter adulthood (Wickrama et al. 2008) and over the course of the 30s and 40s (Mirowsky and Ross 1992). Self-esteem increases during adolescence and into young adulthood (Erol and Orth 2011), as does maturity (Martin 2004; Mirowsky and Ross 1992).

Younger parents may be emotionally unprepared for parenthood. An older first-time parent will have more time to develop emotionally and gain self-confidence before engaging in child-rearing (Heuvel 1988). Qualitative data suggest that older mothers may feel more mature and competent as parents than younger mothers, whereas younger mothers may feel more isolated and restless (Frankel and Wise 1982).

As a result, a young parent may have fewer parenting skills than an older parent (Leigh and Gong 2010) or may be less able to translate good parenting values into actual parenting behavior (Augustine et al. 2015). Positive parenting behaviors increase with maternal age at first birth, and negative parenting behaviors decrease with maternal age at first birth (Conger et al. 1984). In fact, many of the negative associations among young motherhood and children’s educational underachievement, engagement in criminal activity, substance abuse, and mental health problems can be explained by the relationship between maternal age and enhanced childrearing skills and home environments (Fergusson and Woodward 1999).

Compared with older parents, younger parents provide lower levels of emotional support to their children (Hofferth 1987; Moore et al. 1997). They have less knowledge about children’s developmental milestones (Fergusson and Woodward 1999), tend not to invest in the home learning environment to the same extent as older parents (Brooks-Gunn and Furstenberg 1986), and offer less verbal stimulation to young children. Bornstein et al. (2006) showed that the link between maternal age and parenting behavior is linear, such that each additional year of life experience begets greater parenting knowledge and maturity. Similarly, using multivariate regression models that control for an extensive list of family background characteristics, Powell et al. (2006) found that the relationships between parental age and economic resources, social capital, and cultural capital invested in teenagers are generally positive and linear. Finally, older mothers may be in more emotionally stable and supportive unions and experience higher marital satisfaction and better communication between partners. These positive relationship characteristics also arise from maturity, life experience, and skill at communicating and negotiating conflict (Edin and Kefalas 2005).

Maternal social and emotional characteristics have important consequences for healthy child development. Children fare better developmentally when they are raised in an environment characterized by low conflict between their parents and caregivers (Davies and Cummings 1994). Moreover, children of depressed parents are at increased risk of developing internalizing and externalizing behavior problems in general (Cummings and Davies 1994), and clinical depression and anxiety in particular. Both the severity and chronicity of mothers' depressive symptoms are associated with behavior problems in children and with lower vocabulary scores (Brennan et al. 2000).

Present Study

Although the consequences of teen births for both mothers and children have been studied for decades, few studies have taken a broader look at the potential payoffs—and drawbacks—of being born to older mothers. A broader examination is important given the growing gap in maternal ages at birth for children born to mothers with low and high SES. The goal of this study is to examine the empirical relationship between maternal age at childbearing and her child's human capital development, distinguishing between (1) the value for children of being born to a mother who delayed her first birth (general experience) and (2) the value of the additional years between her first birth and the birth of the child whose outcomes are under study (parenting or child-specific experience). Our analyses use data from the Children of the NLSY79 to estimate the associations between children's achievement and behavior problems at ages 10–13 and the years of general and child-specific maternal experience prior to their births. We also attempt to account for these associations using mediators associated with the prenatal environment (maternal smoking and drinking, family structure, and child birth weight), postnatal environment (the quality of the home environment, the number of years two parents are present, and subsequent fertility), plus maternal education and family income.

Our correlational approach to examining the payoff to children of being born to an older mother harkens back to the labor economics approach to estimating the wage payoffs to different kinds of labor market experience (Mincer 1970). In that literature, human capital accumulation was taken to be a product of time spent working in any capacity and the presumably higherpayoff time spent with the current employer and/or working in the current job position. In the empirical implementation of this model, wages were regressed on years of general labor market experience acquired prior to working for the current employer and years of specific experience with the current employer or in the current position.

In our case, child human capital accumulation is assumed to be the product of the advantages of the general experiences acquired by women who delay their first births and, for second- and higher-parity births, the more specific child-rearing and other advantages of additional years beyond the mother's first birth. We operationalize this by dividing the years between age 16 and the given child's birth into (1) years prior to the birth of the first child and (2) years between the first birth and the given birth. For the former, years prior to first becoming a mother provide opportunities to complete more schooling, begin a career, and acquire early adulthood experiences that can lead to more mature decision-making. Years following the birth of a first child can provide parenting-specific experience that might benefit subsequent children as well. Thus, we hypothesize that both types of age experiences positively affect child development. Additionally, because second-birth and subsequent children share parental time and family financial resources and may diminish child development, our regressions also control for family size at the birth of the child.

Data

We use data from the U.S. National Longitudinal Study of Youth (NLSY79), a nationally representative sample of 12,686 young men and women who were aged 14–22 when first surveyed in 1979. Starting in 1986, all children born to the women in the NLSY79 were administered questions and assessments from the Child and Young Adult Supplement of the National Longitudinal Study of Youth (CNLSY), consisting of a battery of assessments and questions (e.g., cognitive, socioemotional, demographic) collected every other year until they reached age 14. As of 2012, the CNLSY79 contained information of 11,512 children born to 4,932 mothers. Two features of these longitudinal data are important for our analysis. First, some of the mothers were sisters, which enables us to compare outcomes for children who are cousins. Comparing children born to mothers who are sisters allows us to control for unobserved timeinvariant characteristics of children's extended family, such as grandparents' education and shared genetics, which could be correlated with maternal age at first birth. Second, unlike many longitudinal surveys that follow just a cohort of children, the CNLSY79 tracks all the children born to NLSY women, which permits comparisons between siblings. Sibling comparisons allow us to control for unobserved maternal characteristics that are constant over time and common to all children in the family. Such characteristics correlated with both birth timing and child outcomes are a source of omitted variable bias in comparisons of children across families.

Owing to the biennial measurement interval of the CNLSY, we combine two distinct samples of children: children born in even years between 1980 and 2002, and children born in odd years between 1981and 2001. These two samples of children are pooled so that the target sample consists of 11,512 children. Children born before 1983 ($n = 3{,}771$) are dropped from the analysis because of the lack of information regarding the home environment assessed by a trained interviewer at age 2 or 3 when the CNLSY began in 1986. The analysis sample consists of 5,380 children who completed the math and reading assessments and 5,673 who completed the socioemotional development assessment at least once between ages 10 and 13 in the child supplement of the CNLSY.

Dependent Variables

Math and Reading Achievement—We use math and reading scores between ages 10 and 13 from the Peabody Individual Achievement Tests (PIAT; math and reading recognition) to measure middle childhood academic skills. For children with more than one nonmissing score during this time (i.e., valid scores at age 10 and 12 or at age 11 and 13), we use the average of the two scores. For the purposes of analysis, scores are standardized to have a mean of 0 and standard deviation of 1 (based on the full CNLSY79 sample distribution). Means and standard deviations of dependent and predictor variables are shown in Table 1. Table 2 presents a correlation matrix for dependent and key predictor variables. The PIAT reading recognition and math test scores are substantially and positively correlated ($r = .65$).

Externalizing Behaviors—We use scores between ages 10 and 13 on the maternally reported externalizing behaviors subscale from the Behavioral Problem Index in the CNLSY as a measure for socioemotional development. Example items include "cheats or tells lies," "is disobedient in school," and "is not liked by other children." Externalizing behaviors show correlations of $r = -.22$ and $r = -.24$ with math and reading achievement, respectively.

Predictor Variables

Years Between Age 16 and Birth of First Child (General Life Experience)—

Years of experience before the first child is defined as the difference between maternal age at the birth of her first child and age 16. Values range between 0 (birth occurred at age 16) and 34.3 (age 50.3) years of experience. [2] The child-based distribution of mother's age at first birth is ages 16–20 (48.8 %), ages 21–25 (28.7 %), ages 26–30 (15.0 %), ages 31–35 (5.9 %), ages 36–40 (1.4 %), and ages 41+ (0.2 %).[3]

Years Between First and Given Child (Parenting Experience)—Years between first and nth child corresponds to the number of years apart a given child is born after the first child of the family. If a given child is the firstborn, this measure will take on a value of 0. Values range between 0 years (twins and firstborns) and 30.6 years. The distribution of sample cases across values of this parenting experience measure is 0 years (43.2 %), 1–2 years (17.3 %), 2–5 years (18.5 %), 6–10 years (13.5%), 11–15 years (5.1 %), 16–20 years (1.9 %), and 21+ years (0.4 %)[4]

Number of Siblings Before Birth—We also include a measure of the count of the total number of siblings at the time of the given child's birth. If a given child is the firstborn child or an only child, this measure takes on a value of 0.

Mediators

We construct measures of a number of factors that may mediate the relationship between a mother's life and parenting experiences and child's human capital. Demographic mediators include years of mother's education at the birth of a given child; the fraction of years between birth and age 13 that the child spent living in a single-parent household; the fraction of years between birth and five years before that given birth that the mother of the child was living as a single mother; the average number of siblings between a child's birth and when he or she was age 13; and total net family income at age 2 or 3, adjusted for year and inflation. Birth weight and prenatal cigarette and alcohol use capture certain measurable fetal origins as mediators. We also examine the mediating role of the early-life home environment by using the Home Observation Measurement of the Environment-Short Form (HOME) score assessed by survey responses and a trained observer of a given child at age 2 or 3.[5] Means and standard deviations of mediator variables are also shown in Table 1.

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[2]This measure accounts for years of general life experience for all children in the analysis sample. Siblings in the same family have the same value for years between age 16 and first birth.

[3]The distribution is at the child level.

[4]This measure accounts for years of parenting experience for all children in the analysis sample: 43.2 % of the children of sample were firstborn children who experienced 0 years of parenting experience.

[5]The HOME instrument uses a different set of items for children aged 0–2 and those aged 3–5. We checked the robustness of our results to using either HOME scores at ages 1–2 or at ages 3–4. We found that the estimates are very similar to those presented in the article, which use HOME scores at ages 2 or 3.

Control Variables

To reduce selection bias, we include a large set of demographic characteristics in our empirical models. Covariates in our model include dummy variable indicators for the child's race (whether black or whether Hispanic), whether the child is female, whether the child is firstborn, and mothers' percentile scores on the Armed Forces Qualifying Test (AFQT, a measure of mothers' academic aptitude assessed in 1980). Also included as covariates are whether the mother ever fought or stole when she was age 18 and whether the mother is U.S.-born. Means and standard deviations of control variables are shown in Table 1. In the case of dichotomous variables (e.g., whether female), the percentage of the sample for which the dichotomous variable is true is shown in Table 1.

Missing Data

The longitudinal nature of data collection results in missing data for the CNLSY. The mediators and covariates in the analysis reported missing values in up to 22.6 % of the possible cases. Following recommended analytic practices (Allison 2001; von Hippel 2007), we use multiple imputation techniques to account for missing values in our mediators and control covariates. Specifically, we use predictive mean matching to impute continuous variables, multinomial logistic regression for categorical variables, and logistic regression for binary variables. For each analysis, 50 data sets are created using chained equations in Stata 13 using the *mi impute* command and then analyzed using the multiple impute and delete approach, in which all observations are used to impute missing data and cases with imputed outcome variables are dropped before the analysis is run.[6]

Methods

We begin by estimating ordinary least squares (OLS) regressions of children's age 10–13 outcomes on the two measures of maternal experience: general life experience and parenting experience. The model also controls for child and maternal characteristics as we describe in the previous section. The estimated model is

$$Outcome_{i,\,j} = \beta_1\ general\ experience_{i,\,j} + \beta_2\ parenting\ experience_{i,\,j} + \mathbf{X}_{i,\,j}\alpha + \varepsilon_{i,\,j},$$

where $Outcome_{i,j}$ is the achievement or behavioral outcomes for child *i* born to mother *j*, and $general\ experience_{i,j}$ measures the years between age 16 and the first birth and varies by mother but not by children born to that mother. $Parenting\ experience_{i,j}$ measures the years between first and a given child and varies by child and mother. $\mathbf{X}_{i,j}$ is a vector of control covariates, such as race and mother's AFQT; and $\varepsilon_{i,j}$, is the error term.

The timing of fertility decisions is endogenous because unobserved characteristics could be imbedded in the error term and correlated with both child development and maternal age at birth. This would happen if women who decide to have a child before adulthood differ in unobserved ways from women who decide to have a child later, and similarly for women who delay motherhood until late adulthood. This leads us to avoid interpreting these OLS

[6]We also used the dummy variable adjustment approach to handle missing data, and the results were very similar.

estimates as causal relations between the two types of maternal experience and the child's development.

We attempt to control for at least a portion of the endogeneity problem by using several identification strategies. In the case of general experience, we compare child outcomes from mothers who are sisters and therefore shared the same family background but who began childbearing at different ages. We refer to this strategy as *cousin fixed effects*. The estimated model in this case is

$$Outcome_{i,j,h} = \beta_1\, general\ experience_{i,j,h} + \beta_2\, parenting\ experience_{i,j,h} + x_{i,j,h}\alpha + \omega_h + \varepsilon_{i,j,h},$$

where h denotes maternal household (extended family), and ω_h controls for time-invariant unobserved characteristics related to maternal family background factors.

Because maternal parenting experience varies across children born to the same mother, we estimate sibling fixed-effects models based on the sibling sample in the CNLSY79. The estimated model in this case is

$$Outcome_{i,j} = \beta_2\, parenting\ experience_{i,j} + x_{i,j}\alpha + \pi_j + \xi_{i,j},$$

where π_j controls for unobserved maternal characteristics that are time-invariant and common to all children born to the same mother. Note that general experience is omitted because it does not vary across siblings born to the same mother. Another important concern is that our sample includes children born across a range of years with mothers born in a fixed set of cohorts, and there could be time trends in children's outcomes that are correlated with changes over time in maternal experience. To address this issue, we control for child's and mother's year of birth cohorts in all the models. Given evidence of high collinearity between our predictors of interest (maternal general and parenting experience) and dummy variables of child's and mother's year of birth, we control only for child's birth cohort in decades.[7] Finally, we augment our estimated models by adding the mediators explained in the previous section.

Results

Main Results

Key regression results for our child outcome measures are presented in Tables 3–5, beginning with math scores measured between age 10 and 13. With controls that include the total number of children at birth, maternal cognitive ability, and others listed in the table note (column 1), each additional year between age 16 and the mother's first birth is associated with a 0.039 standard deviation (SD) increase in math scores (Table 3), a 0.028 SD

[7]We would have preferred to use controls for child's year of birth in single year dummy variables. However, the single-year dummy variables are highly collinear with our two regressors of interest (number of years between age 16 and child's year of birth and numbers of years between first birth and the focal child). For instance, when we use this type of specification, standard errors jump by between 7 and 11 times, and variance-inflation factors are very large. One explanation is that our children are born across many years with relatively few children in each one-year bin, which absorbs a lot of the variation that contributes to identifying our main coefficients of interests.

improvement in reading scores (Table 4), and a 0.029 SD reduction in externalizing behavior problems (Table 5). The estimated coefficient is more than six times its standard error for math, four times its standard error for reading, and five times its standard error for externalizing. The corresponding associations for years between the first and given birth are generally similar (0.032 SD per year for math scores, 0.036 for reading and −0.016 SD for externalizing behaviors scores) and also statistically significant. Tables including the corresponding results associated with the control variables are available in Tables A1–A3 in the online appendix.

Because of concerns that these two segments of maternal experience are endogenous, we attempt to estimate our coefficients on general life experience using cousin fixed effects, and on subsequent experience using sibling fixed effects. Our cousin fixed-effects models compare children born to mothers who are sisters, which controls for shared, unobserved, time-invariant maternal family characteristics. Overall, cousin fixed-effects estimates are less precise but similar in magnitude to the OLS estimates using just the cousin sample (columns 2 and 4 in Tables 3–5). The cousin fixed effects–estimated associations between maternal general experience and children's outcomes are statistically significant for math and externalizing scores (0.028 SD and 0.021 SD, respectively) but not for reading (0.017 SD). The cousin fixed-effects estimations for parenting experience are statistically significant except for the case of externalizing behaviors.

To further address the endogeneity of parenting experience, we exploit the fact that the CNLSY samples all the children born to the focal mother and estimate models with sibling fixed effects. We rely on comparisons of siblings born at different maternal ages, which controls for unobserved children's shared family background characteristics that are time-invariant. For math test scores, our sibling-based family fixed effects coefficient for parenting experience declines in comparison with the OLS for the same sample (0.033 in column 3 vs. 0.018 in column 5 in Table 3). Corresponding regressions for reading achievement show that the associations for the second experience segment are as large as for the first and are robust to the presence of sibling fixedeffects controls (columns 3 vs. 5 in Table 4). Coefficients are similar in absolute magnitude for behavior problems at ages 10–13 (columns 3 vs. 5 in Table 5).[8]

Mediators

The overall ability of our collection of mediators to account for the associations between maternal experience and child outcomes is indicated by a comparison between columns 1, 4, and 5 and columns 6–8 in Tables 3–5. For the math outcome, the coefficient on years between age 16 and first birth (general experience) falls by approximately one-fourth (from .039 to .029 in the OLS full sample) when the mediators are added. Both reading and behavior problems follow a similar pattern, with coefficients falling between roughly one-fourth and one-third. The coefficients for general life experience also decline when we add the mediators to the cousin fixed-effects models (columns 4 and 7 in Tables 3–5), and they

[8]We also estimated models including interactions between the two types of maternal age experiences. We found that the coefficients on the interaction term between maternal general and parenting experience were not significant and were robust to this alternative specification. Results are available upon request.

are no longer statistically significant. These patterns of results indicate that the mediators may play some role in accounting for the associations between life experience and children human capital. In the case of years between the first and given birth (parenting experience), the mediators account for considerably less of the associations given that the estimated coefficients are similar in magnitude without and with mediators (columns 5 and 8 in Tables 3–5).

Many of the mediators themselves are significant predictors of our early teen outcomes (results shown in Tables 3–5, columns 6–8). In the non-fixed-effects models involving achievement outcomes, maternal education, home environment scores, birth weight, and family structure following childbirth are all significant predictors. For behavior problems, prenatal cigarette use and total net family income at age 2 or 3 are significant as well. Many fewer of these measures retain statistical significance in the sibling fixed-effects models, in part because the limited or perhaps error-inducing sibling differencing drives up standard errors.

Mediation is a joint product of the association between mediators and outcomes shown in columns 6–8 in Tables 3–5 and the associations between our maternal experience measures and the mediators, which are shown in Table 6 and in the online appendix, Tables A4–A11. Mediators are treated as dependent variables in Table 6 and in the online appendix, Tables A4–A11. Independent variables include our two maternal experience variables; demographic controls; and, in the case of mediators other than maternal education, maternal education itself. This reflects a recursive model in which the maternal schooling mediator is considered to be causally prior to the others mediators.

By far, the strongest relationship between years prior to the first birth and the mediators is with years of maternal schooling (shown in Table 6); each year of postponing a first birth is associated with nearly one-fifth (0.18) of a year of completed schooling (column 1, Table 6).[9] When this coefficient is multiplied by the 0.029 coefficient on maternal schooling in the math OLS regression in column 6 of Table 3, increases in maternal schooling account for a little less than one-sixth of the estimated payoff to delaying a first birth (found in column 1, Table 3). The number of years between the first and the given birth is also associated with more maternal schooling, although the coefficients and possible mediational role are considerably smaller than the case for years delaying first birth. Broadly similar results are found for the reading and behavior problems outcomes. Other mediators account for less of these associations, in part because of a weak association with one or both of the mediational paths. Particularly surprising were the weak associations between the two maternal experience segments and both birth weight and scores from the assessment of the quality of the home environment.

[9]One potential concern in the estimations of maternal years of education as an outcome is simultaneity and reverse causality. To address this concern, we performed an instrumental variables analysis to deal with endogeneity issues of the timing of first birth. Specifically, we used state changes in Medicaid abortion funding restrictions during the 1980s and 1990s as an instrument for maternal age of first birth. We defined the instrument as the fraction of years between age 16 and 20 that the mother lived in a state with Medicaid funding restrictions while conditioning on additional state characteristics such as income per capita, unemployment rate, and average AFDC benefit per family. Table A12 in the online appendix shows that these funding restrictions are significantly associated with the timing of the first birth in the first stage, and our OLS estimates in Table 6 lie within the 95 % confidence interval for our two-stage least squares (2SLS) estimates.

Robustness Checks

An important remaining concern is that cousin fixed effects do not control for time-varying maternal unobserved characteristics related to both fertility decisions and future child development. To understand the causal impact of an additional year of general life experience, we attempt to implement an instrumental variables approach, using miscarriages and timing of changes in abortion laws across states from 1970 to 1998 as instruments. The timing of these changes fits particularly well with the birth years of the firstborn children in our sample. Although some of those instruments produce strong first-stage estimates, coefficients in the second stage are too imprecisely estimated to support confident conclusions (see online appendix, section B, for more details).

An additional concern is the presence of nonlinearities in the relationship between maternal age and child development. We estimate categorical, quadratic, and spline forms to both general and parenting experience, and these models show some evidence that the relationships appear to increase monotonically with age. Table A13 in online appendix C shows estimations that allow for nonlinearities in both maternal general life experience (number of years between age 16 and the age at first birth) and parenting experience (number of years between the first child and the focal child) by including dummy variables for two-year bins (with 0–2 years as the base category) instead of a linear parameterization. These results suggest that the effect of general experience increases monotonically as mothers delay their first birth. For example, in the OLS full sample (column 1 of Table A13, online appendix), the association between delaying the first birth to 22–24 years old (4–6 years after age 16) and child math score is 0.14 SD. In contrast, delaying to more than 36 years is associated with a 0.5 SD increase in math scores (both with respect to having the first child between age 16 and 18). Nevertheless, the estimates of the nonlinear associations are not statistically significant when we include the cousin fixed effects.[10] For the case of parenting experience, the nonlinear estimates also show an increasing relation, although not all the bins are statistically significant.

In the last rows of Table A13 in the online appendix, we show the results of two hypothesis tests for each of the two measures of maternal experience: (1) the coefficients of each bin are equal to each other, and (2) the coefficients are jointly equal to 0. For maternal general experience using OLS, we find evidence that the association between maternal general experience and child outcomes is different from 0 and that a greater number of years is associated with larger benefits to children’s human capital. Parallel tests on specific experience show broadly similar, although less definitive, patterns.

Last, we explore whether the relationships between maternal age and child’s human capital differ by markers of SES: race (black and Hispanic, with white as the omitted category), maternal education (high school or less vs. more than high school), and maternal cognitive ability (AFQT score) (Table A14 in the online appendix, section C). We do not find consistent evidence of heterogeneity in the relationships between general and parenting experiences by SES.[11]

[10]This is not surprising because this specification requires within cousin variation at different bins.

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Summary

The question of the optimal maternal age at birth for offspring's development and attainment is both scientifically important and policy-relevant. We provide new evidence for U.S. children born between 1980 and 2002. Similar to prior research (e.g., Powell et al. 2006), we find developmental advantages that accrue to children born to older mothers, and this relationship appears to be linear.

Our study expands the literature on the relationship between maternal age at childbearing and child's development by studying both the role of delaying her first birth but also the role of years between her first birth and the birth of the focal child. Delaying a first birth beyond the teen years enables mothers to invest more in their education and to enhance their social and emotional skills, which could result in more enriched and nurturing family environments. Additional advantages associated with "on-the-job training" lessons from experiences rearing firstborn children may accrue to delays in second and subsequent births: for instance, benefits associated with learning parenting practices.

Using data from the Children of the NLSY79 and controlling for a large set of sociodemographic characteristics, we find that each year the mother delays a first birth is associated with a 0.028 SD and 0.039 SD increase in reading and math achievement and a 0.029 SD reduction in teen behavior problems. Coefficients are about as large for additional years between the first and given birth. Surprisingly, we fail to find evidence of eventual declines in the payoffs to both of our experience segments, which precludes speculation about optimal birth ages for promoting child developmental outcomes. Our results are fairly robust to the inclusion of controls for cousin and sibling fixed effects in the majority of outcomes, although our efforts to confirm our results using instrumental variables procedures proved unsuccessful. Future work could better address time-varying endogeneity concerns by finding better instruments for maternal general and parenting experience that are both strong and exogenous.

In addition, we perform mediation analyses to examine the role of mechanisms such as maternal education, prenatal investment, health at birth, parenting, and other characteristics. Given our long list of mediators, we are surprised that most of associations between birth delays and child outcomes remain unexplained. Future work on mediational pathways is clearly a useful direction for future research.

At the same time, our mediational analyses show that an important pathway by which delaying first births benefits children is by enabling mothers to complete more years of schooling. Other research suggests that parental education plays an important and plausibly causal role in children's development (Salvanes and Bjorklund 2010). The positive effect on children's outcomes may arise from higher earnings and increased family incomes or from more productive child socialization strategies (e.g., Guryan et al. 2008; Kalil, et al. 2012). Or, as Michael (1972) noted, skills acquired through schooling may enhance parents'

[11]We find only some evidence that (1) for our reading outcome, the association between both life and general experience and adolescent reading performance is lower for more-educated mothers; and (2) for externalizing behavior, the relationship of both life and parenting experience and externalizing problems is more beneficial for Hispanics.

abilities to organize their daily routines and resources in a way that enables them to accomplish their parenting goals effectively. Regardless of the reason, our evidence supports the idea that promoting maternal schooling enhances child developmental outcomes and that efforts to assist women in their fertility planning may help them obtain additional schooling.

Our estimated coefficients are a small fraction of a standard deviation, but it is important to remember that they reflect changes in child outcomes associated with a single year increase in mothers' experience. Given the apparent linearity of our estimated relations, this means that more substantial delays (e.g., in first births from age 18 and 23) would be associated with considerably more substantial gains in children's age 10–13 developmental outcomes. Also, as the Duncan et al. (2017) accounting exercise suggested, the three- to five-year increase in the age-at-birth gaps between high- and low-SES women over the last several decades has important implications for the schooling attainment gap between high- and low-SES children. Reductions in teen pregnancy have not shrunk the SES-based achievement gap for children, in part due to the rising maternal birth ages of higher-SES mothers. At the same time, counteracting the possible benefits of delaying fertility beyond the teen years for lower-SES mothers, falling fertility rates have produced little change in mother's age at birth for the typical child born into a low-SES household. All in all, maternal age at birth plays a significant demographic role for our understating of the changing fortunes of high- and low-SES children.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

This study was supported by the Eunice Kennedy Shriver National Institute of Child Health & Human Development of the National Institutes of Health under Award Number P01HD065704. The authors thank Kathleen Ziol-Guest and seminar participants at the 2015 Irvine Network on Interventions in Development conference and the 2015 annual meeting of the Population Association of America Conference for helpful comments and discussions, and Marianne Bitler for sharing data on changes in abortion laws across states between 1979 and 1998.

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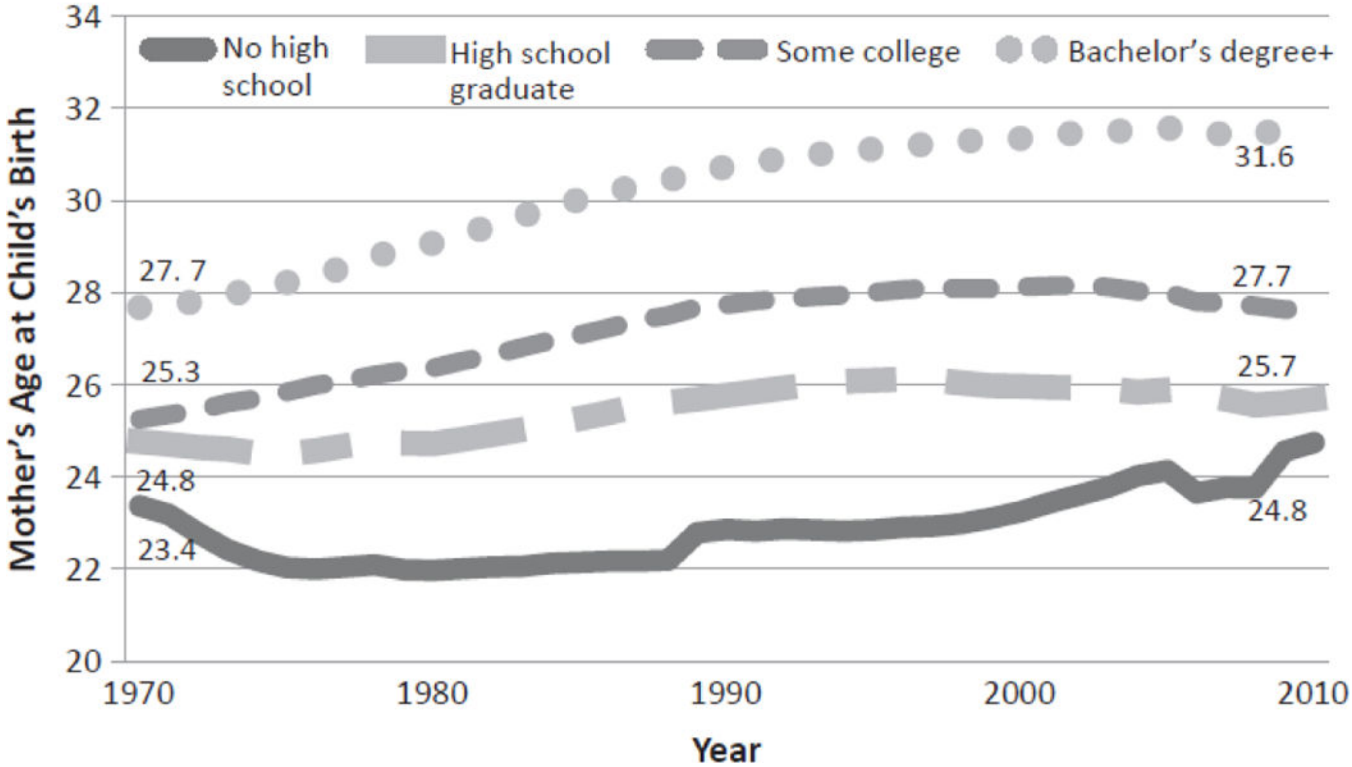

Fig. 1.

Maternal age gap between children born to high school dropouts and college graduates grew more than 2.5 years from 1970 to 2010. Average of mother's age at child's birth by maternal reports of schooling levels. The sample consists of 50 % to 100 % of all U.S. births from the Natality Detail File

Table 1

Summary statistics

	Full Sample (*N* = 7,738		Cousin Sample (*N* = 2,437)		Sibling Sample (*N* = 6,978)	
	Mean or %	**SD**	**Mean or %**	**SD**	**Mean or %**	**SD**
Outcome Variables (ages 10/12 or 11/13)						
Math	102.94	14.40	102.63	14.65	102.76	14.38
Reading	104.37	15.30	103.83	15.38	104.03	15.34
Externalizing behaviors	102.40	14.02	101.56	13.12	102.43	14.09
Predictor Variables						
Years between age 16 and first child	8.10	5.21	8.35	5.18	7.57	4.91
Years between first and given child	4.45	4.91	4.34	4.93	4.94	4.93
Number of siblings before birth	1.19	1.22	1.18	1.25	1.31	1.22
Mediators						
Mother's education at birth	12.73	2.43	12.91	2.30	12.66	2.43
HOME score at age 2 or 3	96.61	16.65	96.41	17.00	96.22	16.83
Birth weight	117.27	21.47	116.98	21.43	117.60	21.45
Prenatal cigarette use per day	.21	.45	.19	.43	.21	.45
Prenatal alcohol use per month	.22	.25	.22	.25	.22	.25
Fraction of years between birth and age 12 with biological father in household	.71	.38	.70	.38	.72	.38
Number of siblings between birth and age 13	.67	.90	.72	.94	.74	.92
Adjusted total family income at age 2 or 3 ($10,000)	7.85	28.20	8.15	30.42	7.72	28.19
Covariates						
Black (%)	25.14		27.78		25.51	
Hispanic (%)	19.72		18.38		20.41	
Female (%)	49.06		49.73		49.01	
Mother's AFQT Score	39.07	28.22	38.01	28.55	38.51	28.27
Mother ever fight (%)	17.64		17.86		18.07	
Mother ever steal (%)	23.16		25.50		23.22	
Mother U.S.-born (%)	92.14		94.01		91.90	
Firstborn (%)	32.41		32.83		25.06	

Table 2

Correlations between outcome variables and key predictors

	(1)	(2)	(3)	(4)	(5)	(6)
Outcome Variables (ages 10/12 or 11/13)						
Math (1)	1.00					
Reading (2)	.65***	1.00				
Externalizing behaviors (3)	−.22***	−.24***	1.00			
Predictor Variables						
Years between age 16 and first child (4)	.34***	.30***	−.16***	1.00		
Years between first and given child (5)	−.15***	−.15***	.01	−.51***	1.00	
Number of siblings before birth (6)	−.19***	−.21***	.02	−.46***	.76***	1.00

* $p < .05$

** $p < .01$

*** $p < .001$

Table 3

Math in early adolescence, regressed on maternal experience and other controls

	OLS			Fixed Effects (FE)		With Mediators		
	Full Sample (1)	Cousin Sample (2)	Sibling Sample (3)	Cousin FE (4)	Sibling FE (5)	OLS (6)	Cousin FE (7)	Sibling FE (8)
Years Between Age 16 and First Child	0.039 *** (0.006)	0.029 ** (0.010)	0.043 *** (0.006)	0.028 * (0.012)		0.029 *** (0.006)	0.021 (0.013)	
Years Between First and Given Child	0.032 *** (0.006)	0.029 * (0.012)	0.033 *** (0.007)	0.034 * (0.014)	0.018 * (0.009)	0.028 *** (0.006)	0.027 † (0.014)	0.017 † (0.009)
Number of Siblings Before Birth	−0.078 *** (0.020)	−0.059 (0.036)	−0.077 *** (0.020)	−0.083 (0.052)	0.010 (0.032)	−0.047* (0.021)	−0.095 † (0.056)	0.061 (0.075)
Mediators								
Mother’s education at birth						0.040 *** (0.009)	0.042 * (0.021)	0.015 (0.016)
HOME score at age 2 or 3						0.102 *** (0.016)	0.046 (0.032)	0.041 * (0.021)
Birth weight						0.053 *** (0.014)	0.069 * (0.029)	0.082 *** (0.023)
Prenatal cigarette use per day						0.021 (0.017)	0.080 † (0.047)	0.013 (0.032)
Prenatal alcohol use per month						0.025 † (0.014)	0.028 (0.031)	0.019 (0.022)
Fraction of years between birth and age 13 in single-parent household						−0.158 *** (0.046)	−0.156 (0.124)	–0.170 (0.139)
Number of siblings between birth and age 13						−0.033 * (0.016)	−0.078 * (0.035)	0.037 (0.071)
Adjusted total family income at age 2or 3						0.004 (0.011)	0.010 (0.020)	−0.001 (0.013)
Fraction of 5 years before birth in single-parent household						0.031 (0.046)	−0.001 (0.096)	0.158 * (0.074)
Constant	−0.566 *** (0.108)	−0.405 * (0.191)	−0.606 *** (0.112)	−0.302 (0.218)	0.074 * (0.037)	−0.851 *** (0.138)	−0.441 (0.384)	−0.239 (0.255)
Number of Observations	5,380	1,762	4,967	1,762	4,967	5,380	1,762	4,967

Notes: Standard errors are shown in parentheses. Age 10 to 13 math scores are standardized values for children with valid values in at least one year. Control variables include black, Hispanic, female, firstborn, mother's AFQT score, mother ever fight, mother ever steal, mother U.S.-born, firstborn, mother's birth year, and child's birth decade (born 1980s, 1990s, 2000s).

† $p < .10$

* $p < .05$

** $p < .01$

*** $p < .001$

Table 4

Reading in early adolescence, regressed on maternal experience and other controls

	OLS			Fixed Effects (FE)		With Mediators		
	Full Sample (1)	Cousin Sample (2)	Sibling Sample (3)	Cousin FE (4)	Sibling FE (5)	OLS (6)	Cousin FE (7)	Sibling FE (8)
Years Between Age 16 and First Child	0.028*** (0.006)	0.025* (0.010)	0.033*** (0.006)	0.017 (0.013)		0.020*** (0.006)	0.011 (0.013)	
Years Between First and Given Child	0.036*** (0.007)	0.038** (0.012)	0.039*** (0.007)	0.042** (0.013)	0.035*** (0.009)	0.033*** (0.007)	0.035** (0.013)	0.033*** (0.009)
Number of Siblings Before Birth	−0.124*** (0.020)	−0.136*** (0.037)	−0.123*** (0.020)	−0.146** (0.052)	−0.105*** (0.031)	−0.096*** (0.020)	−0.165** (0.058)	−0.025 (0.070)
Mediators								
Mother’s education at birth						0.030** (0.009)	0.016 (0.019)	0.004 (0.014)
HOME score at age 2 or 3						0.107*** (0.017)	0.060† (0.033)	0.046* (0.022)
Birth weight						0.040** (0.014)	0.055† (0.029)	0.056* (0.022)
Prenatal cigarette use per day						−0.017 (0.018)	0.082† (0.044)	0.016 (0.029)
Prenatal alcohol use per month						−0.003 (0.014)	−0.002 (0.031)	−0.009 (0.020)
Fraction of years between birth and age 13 in single-parent household						−0.168*** (0.051)	−0.218† (0.129)	−0.138 (0.137)
Number of siblings between birth and age 13						−0.031* (0.016)	−0.093* (0.038)	0.073 (0.067)
Adjusted total family income at age 2 or 3						0.005 (0.011)	−0.000 (0.024)	−0.013 (0.014)
Fraction of 5 years before birth in single parent household						0.059 (0.048)	0.049 (0.102)	0.044 (0.074)
Constant	−0.743*** (0.118)	−0.668** (0.211)	−0.797*** (0.123)	0.028 (0.241)	−0.060† (0.036)	−0.936*** (0.148)	−0.073 (0.431)	−0.241 (0.233)
Number of Observations	5,376	1,762	4,963	1,762	4,963	5,376	1,762	4,963

Notes: Standard errors are shown in parentheses. Age 10 to 13 reading scores are standardized values for children with valid values in at least one year. Control variables include black, Hispanic, female, firstborn, mother’s AFQT score, mother ever fight, mother ever steal, mother U.S.-born, firstborn, mother’s birth year, and child’s birth decade (born 1980s, 1990s, 2000s).

† $p < .10$

* $p < .05$

** $p < .01$

*** $p < .001$

Table 5

Externalizing in early adolescence, regressed on maternal experience and other controls

	OLS			Fixed Effects		With Mediators		
	Full Sample (1)	Cousin Sample (2)	Sibling Sample (3)	Cousin FE (4)	Sibling FE (5)	OLS (6)	Cousin FE (7)	Sibling FE (8)
Years Between Age 16 and First Child	−0.029*** (0.006)	−0.028** (0.009)	−0.034*** (0.006)	−0.021† (0.012)		−0.019** (0.006)	−0.020 (0.012)	
Years Between First and Given Child	−0.016* (0.007)	−0.027* (0.013)	−0.017* (0.007)	−0.008 (0.013)	−0.024** (0.010)	−0.017* (0.007)	−0.005 (0.013)	−0.025* (0.010)
Number of Siblings Before Birth	−0.005 (0.022)	0.038 (0.038)	−0.006 (0.022)	−0.058 (0.040)	−0.000 (0.030)	−0.032 (0.022)	−0.081† (0.044)	0.060 (0.063)
Mediators								
Mother’s education at birth						−0.023* (0.010)	0.000 (0.019)	−0.014 (0.014)
HOME score at age 2 or 3						−0.154*** (0.017)	−0.089** (0.031)	−0.024 (0.021)
Birth weight						−0.009 (0.015)	−0.000 (0.026)	−0.018 (0.021)
Prenatal cigarette use per day						0.104*** (0.020)	0.055 (0.047)	0.022 (0.034)
Prenatal alcohol use per month						0.013 (0.014)	0.019 (0.026)	−0.016 (0.021)
Fraction of years between birth and age 13 in single-parent household						0.236*** (0.052)	0.122 (0.111)	0.041 (0.126)
Number of siblings between birth and age 13						−0.024 (0.017)	−0.032 (0.033)	0.065 (0.060)
Adjusted total family income at age 2 or 3						−0.024** (0.008)	−0.022 (0.014)	−0.003 (0.011)
Fraction of 5 years before birth in single-parent household						0.024 (0.047)	0.155† (0.084)	0.020 (0.079)
Constant	0.457*** (0.122)	0.179 (0.197)	0.475*** (0.128)	0.344 (0.215)	0.174*** (0.035)	0.545*** (0.149)	0.400 (0.357)	0.213 (0.225)
Number of Observations	5,673	1,830	5,215	1,830	5,215	5,673	1,830	5,215

Notes: Standard errors are shown in parentheses. Age 10 to 13 externalizing scores are standardized values for children with valid values in at least one year. Control variables include black, Hispanic, female, firstborn, mother's AFQT score, mother ever fight, mother ever steal, mother U.S.-born, firstborn, mother's birth year, and child's birth decade (born 1980s, 1990s, 2000s).

† $p < .10$

* $p < .05$

** $p < .01$

*** $p < .001$

Table 6

Mother's education at birth, regressed on maternal experience (years before first birth and years between first and given child) and controls

	OLS			Fixed Effects (FE)	
	Full Sample (1)	Cousin Sample (2)	Sibling Sample (3)	Cousin FE (4)	Sibling FE (5)
Years Between Age 16 and First Child	0.177*** (0.013)	0.175*** (0.021)	0.187*** (0.014)	0.121*** (0.024)	
Years Between First and Given Child	0.048*** (0.015)	0.056** (0.020)	0.048** (0.015)	0.045** (0.017)	0.055*** (0.009)
Number of Siblings Before Birth	−0.277*** (.044)	−0.147* (0.070)	−0.270*** (0.043)	−0.078 (0.059)	−0.091*** (0.022)
Covariates					
Black	1.434*** (0.084)	1.269*** (0.154)	1.406*** (0.089)	0.069 (0.318)	
Hispanic	0.343*** (0.102)	0.272 (0.201)	0.329** (0.107)	−2.079** (0.758)	
Female	0.038 (0.045)	−0.016 (0.073)	0.061 (0.047)	−0.024 (0.055)	0.009 (0.017)
Firstborn	−0.290*** (0.064)	−0.047 (0.105)	−0.193** (0.062)	−0.049 (0.064)	−0.030 (0.022)
AFQT score	0.048*** (0.002)	0.046*** (0.003)	0.047*** (0.002)	0.027*** (0.004)	
Mom ever fight	−0.198* (0.085)	−0.039 (0.165)	−0.203* (0.090)	0.033 (0.162)	
Mom ever steal	−0.227** (0.078)	−0.323* (0.144)	−0.253** (0.084)	−0.133 (0.146)	
Mother U.S.-born	0.685*** (0.191)	0.380 (0.406)	0.798*** (0.205)	1.512* (0.663)	
Constant	8.491*** (0.303)	9.373*** (0.611)	8.357*** (0.323)	9.788*** (0.827)	12.505*** (0.026)
Number of Observations	5,264	1,660	4,770	1,660	4,770

Notes: Standard errors are shown in parentheses. Control variables include mother's birth year and child's birth decade (born 1980s, 1990s, 2000s).

* $p < .05$

** $p < .01$

*** $p < .001$