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Academic and Behavioral Outcomes Among the Children of Young Mothers

In this article, we use newly available data from the National Longitudinal Survey of Youth to investigate the effects of early motherhood on academic and behavioral outcomes for children born to early child bearers. We find that early motherhood's strong negative correlation with children's test scores and positive correlation with children's grade repetition is almost entirely explained by prebirth individual and family background factors of teen mothers themselves. However, early childbearing is associated indirectly with reduced children's test scores through its linkage to family size (and thus to child birth order). We find a different pattern in predicting fighting, truancy, early sexual activity, and other problem behaviors among adolescent and young adult offspring. For these behaviors, maternal age at first birth remains an important risk factor even after controlling for a wide range of background factors and maternal characteristics. These results highlight the diverse pathways through which teen parenting might influence subsequent child well-being and social performance.

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Controlling for background factors, do the children of teen mothers experience worse behavioral and academic outcomes than their comparable peers do? Although this is a central question of public and academic concern, there is little consensus about the link between early parenting and subsequent child outcomes. The lack of available research is especially pronounced regarding adolescent outcomes, although such outcomes constitute a principal area of policy concern.

Many researchers and policy makers argue that young mothers, especially teen mothers, are less able to emotionally and financially nurture capable, healthy, well-adjusted offspring (Hayes, 1987; Maynard, 1997). These fears are heightened by the strong first-order correlation between early parenthood and many poor child outcomes including low birth weight, low cognitive test scores, behavioral problems, grade repetition, and adult economic disadvantage.

Early work concentrating on these associations supported the popular belief of teen parenthood's dire consequences. For example, the 1987 two-volume treatment of teen parenthood *Risking the Future* states,

> The personal costs resulting from unintended pregnancies and untimely birth are far too high

> to countenance an indifferent response. . . . Heightened health and developmental risks to the children of adolescent mothers are a few of the most obvious and immediate personal costs. (Hayes, 1987, p. ix)

However, later work has questioned the causal role played by early parenting and has paid more explicit attention to other family and individual background factors that might account for teen parenthood's apparently detrimental effects. By 1994, some investigators openly questioned the conventional wisdom regarding early parenthood (Geronimus, Korenman, & Hillemeier, 1994). Geronimus et al. write,

> Our finding that, net of family background factors, teen childbearing may not adversely affect early childhood development casts doubt . . . on the presumptive benefits to children of efforts to alter women's fertility behavior. (p. 605)

This article uses recently available data to examine a variety of adolescent behavioral outcomes to create a more complete picture of the relationship between maternal age and child outcomes. It also examines psychometric test scores of younger children and retention in school—two key indicators of academic performance. In four ways, this article contributes to the literature on the impact of early parenting on subsequent outcomes among children.

First, we look at outcomes for a group that has received less systematic attention in the teen parenting debate: adolescents and young adults born to teen mothers. We seek to predict several behavioral and academic measures for this group—measures that may reflect the different causal pathways by which teen childbearing is correlated with subsequent outcomes for children. Most of our behavioral outcomes have received little attention in previous work on teen childbearing effects. (See Maynard, 1997, for work that treats related outcomes for adolescents.)

Second, we replicate earlier research, notably that of Geronimus et al. (1994) and Moore, Morrison, and Greene (1997), by also examining correlates of academic test scores. Using later available waves of the same longitudinal data source used in these two studies, we explore whether there are important changes in a more recent sample that includes older children.

Third—again using a longer time frame of data following mothers and their children—we examine outcomes for higher-parity offspring of women who first gave birth during the teen years. Additional years of data allow us to examine a more representative picture of teen mothers' family constellations than was possible with earlier sources.

Finally, the longer time frame allows a more representative comparison group of children born to women who delayed childbearing past their teen years. One can examine many effects of childbearing on teen mothers themselves by following a cohort of women into their mid-20s. When studying the impact of teen childbearing on the next generation, however, one must compare children born to teen mothers to their counterparts whose mothers delayed their first births. This requires a longer period to identify women who delay their childbearing but who eventually have children. The longer a sample is followed, the better the sample will represent the full population of children born to mothers of all ages.

In all of our analyses, we measure maternal age at first birth with a set of four dummy variables (16 years old and under, 17–18, 19, and 20–21, with over 21 as the reference category) as opposed to a single dichotomous teen or nonteen variable. This approach allows us to assess whether childbearing in the early teen years affects children differently than in the later teen years and whether childbearing just after the teen years is associated with similar outcomes as teen childbearing.

In the following sections, we first review relevant previous studies of adolescent parenthood effects. We next describe the data and methods we use to study the effects of early childbearing on adolescent and young adult children. We then summarize and discuss our results. We conclude with a discussion of study limitations, policy implications, and directions for future research.

Previous Studies of Adolescent Parenthood Effects

Academics, politicians, philanthropists, and the public at large have long been fascinated with teen parenthood as a social problem. Although decision makers within government and private philanthropy have often assumed early childbearing to be the root cause of many social dislocations and disadvantages, academics have been less certain. Empirical work on the effects of teen motherhood has created a mixed picture of the causal power of early childbearing. The literature consistently shows a strong correlation between teenage parenting and many negative outcomes. However, the actual causal relationships and possible policy interventions are less clear.

As noted previously, the two-volume *Risking the Future* (Hayes, 1987) warned of the detrimental consequences of teen parenting. But several important later studies criticized early work of the kind summarized by Hayes for its failure to adequately separate the effects of individual, family, and community characteristics correlated with adolescent childbearing that are harmful to children. Factors that lead certain young women to bear children may reflect more fundamental economic and educational disadvantages. Conceptually and empirically, it is therefore difficult to isolate the consequences for children that stem uniquely from teen parenthood.

Moreover, teen parenting likely has different effects on different outcomes. If teen parenting causes economic hardship, childhood outcomes that are especially income sensitive will show the strongest effects. If, however, the dominant impact of early childbearing is to alter parenting skills and behaviors, one might observe large effects for childhood outcomes that are relatively unrelated to mothers' economic status. Outcomes must therefore be individually examined to produce an overall understanding of the link between early parenting and subsequent well-being of children.

The recent literature on the effects of early childbearing on teen mothers themselves examines educational outcomes, adult economic status and welfare use, family formation, and employment (Bronars & Grogger, 1994; Corcoran & Kunz, 1997; Geronimus & Korenman, 1992; Hoffman, Foster, & Furstenberg, 1993; Hotz, McElroy, & Sanders, 1997). Three of these five studies use fixed-effects sibling models. Hotz et al. compare teens who had live births with teens who had miscarriages. Bronars and Grogger compare teen mothers who had twins with teen mothers who had singleton births under the assumption that having two children at the same time has twice the impact of having one. All of these studies produce notably smaller point estimates than did earlier research that included more limited controls for background factors correlated with teen parenting. For a more extensive review of the literature on teen parenthood effects, see Coley and Chase-Lansdale (1998).

The recent literature on the effects on children of maternal age at first birth has examined birth and early health outcomes, psychometric tests, educational outcomes, psychological well-being, home environment, early fertility, delinquency and early behavior problems, incarceration, and adult financial status (Geronimus & Korenman, 1993; Geronimus et al., 1994; Grogger, 1997; Hardy, Shapiro, Astone, Miller, & Brooks-Gunn, 1997; Haveman, Wolfe, & Peterson, 1997; Moore et al., 1997). The two articles by Geronimus and colleagues use fixed-effects cousin comparisons. The other articles use explicit controls. Grogger compares the children born to women when they are teens with children born later to mothers who began childbearing as adolescents. (See Hao, Matsueda, & Earnhart, 1998, for a similar approach using a fixed-effects sibling comparison.) Recent estimates for effects on children are less consistent than recent work on effects on teen mothers themselves. Moore et al. find teen childbearing effects on cognitive tests and home environment; Grogger finds effects on male incarceration rates; and Haveman et al. and Hardy et al. find effects on educational attainment, early fertility, and economic outcomes. However, Geronimus et al. find no effects on children's cognitive development or home environments. Geronimus and Korenman (1993) find no negative effects (and a few positive effects) on most of their infant health outcomes.

National Longitudinal Survey of Youth Sample and Measures

The National Longitudinal Survey of Youth (NLSY) follows a national sample of 12,686 young men and women who were between the ages of 14 and 21 in 1979. The respondents were interviewed annually until 1995, when the survey became biannual. The NLSY oversampled African Americans, Hispanics, and poor Whites (although the poor White sample was dropped because of funding constraints after 1988). Children born to the female respondents began to be tracked in 1986 with biannual interviews (of mother and child, depending on the child's age) and assessments of psychometric and behavioral factors. Beginning in 1994, children age 14 and over (officially referred to as the "young adults" by the NLSY) received a separate interview designed to explore issues relevant to older children of the original NLSY sample such as sexual behavior, substance use, pregnancy, school completion, and criminal behavior. It is this group of older children we refer to as the adolescent and young adult children. Since its 1986 inception, the Mother-Child file has included interviews with 10,505 children of the NLSY females. In 1996 (the latest survey year available), 7,103 of these children were interviewed. Of these, 5,431 were under the age of 14 and were eligible for the psychometric assessments we investigate. The additional 1,672 were at least 14 years old and received the survey questions we analyze about grade repetition and what we call behavioral outcomes (early sexual activity, truancy, smoking tobacco or marijuana, and fighting). Children 14 and over are not given the psychometric assessments.

Dependent Variables

In examining the effects of teen motherhood on children, we were interested in young children's cognitive test scores, grade repetition, and adolescent behavioral factors. Specifically, our dependent variables for the younger children (under age 14) are the Peabody Individual Achievement Test (PIAT) mathematics subscale, administered to children aged 5 or older; the PIAT reading comprehension subscale, administered to children aged 5 or older who achieved a score of at least 19 on the PIAT reading recognition subscale; and the revised Peabody Picture Vocabulary Test (PPVT), which measures heard vocabulary recognition and is administered to children aged 3 or older. We analyzed results for the PIAT reading recognition test as well but found results to be similar to those for reading comprehension. For simplicity, we solely show the comprehension results. We use the 1996 scores for the PIAT math and reading tests. We use the 1992 PPVT score, because 1992 is the most recent year the test was administered to the full sample of eligible children. We use the raw test scores, with appropriate child age controls, because the standardized scores artificially constrain variance across scores. Our dependent variables for the adolescent and young adult sample (age 14 and older) are repeating a grade in school; having sexual intercourse before the age of 16 (children not yet 16 by the end of 1996 are excluded from the analyses of this outcome); truancy, which is coded as 1 if the respondent reported having skipped school in the past year; fighting in school or at work in the past year; and smoking marijuana in the last 30 days. Also, in analyses not shown, we treated tobacco smoking as a dependent variable and found similar results to those of smoking marijuana.

Independent Variables

Our main independent variables of interest are dummies for maternal age at first birth. We include whether the mother was 16 or younger, 17–18, 19, or 20–21 when she had her first child. We include ages 20–21 because mothers who gave birth in their early 20s may experience different outcomes than mothers who delayed childbirth until later years. The reference category is whether a mother was over 21 years of age. However, given the structure of the NLSY, the age range of the reference category is truncated. The highest age of first birth in the reference category varies depending on for which sample the particular dependent variable is measured. No mother initiated childbearing after age 34 for the sample given the math and reading tests, after age 32 for the sample given the PPVT test, or after age 24 for the adolescent and young adult sample surveyed about grade repetition and our behavioral factors of interest. All models also include controls for the child's age. For the young children's outcomes, we broke the full range of child ages in months into six categories of roughly equal numbers of respondents and created corresponding dummy variables to allow for a nonlinear relationship between age and test score. For the adolescents, we included a dummy variable for each year of age between 14 and 19, with age 20 or over used as the omitted category.

To control for background factors correlated with maternal age at first birth, we also include many other explanatory variables. These include grandmother's education (high school, less than high school, or more than high school); mother's urban/rural and South/non-South residence at age 14; mother's household structure at age 14 (whether the mother lived with both biological parents, with any biological parent, or in a single- or no-parent household); and grandmother's labor force status (employed outside the home or not) when the mother was 14. We also include mother's score on the Armed Forces Qualifying Test (AFQT), which was administered to all NLSY respondents in 1980. The AFQT measures reading comprehension, vocabulary, and mathematics skills. AFQT scores reflect both genetic endowment and environment. In addition, we control for race, Hispanic origin, and child's gender. In some models, we also include child's birth order and family size.

Table 1 contains weighted means for all variables that appear in the analyses.

METHOD

We use the inclusion of explicit control variables to control for the effect of maternal background.

TABLE 1. WEIGHTED MEANS FOR NLSY DATA

Variable	NLSY Child Sample[a] Unweighted *n*	NLSY Child Sample[a] Weighted Mean	NLSY Young Adult Sample[a] Unweighted *n*	NLSY Young Adult Sample[a] Weighted Mean
Ever repeated a grade in school	—	—	1,258	0.27
Had first sexual intercourse before age 16	—	—	785	0.41
Smoked marijuana in past 30 days	—	—	1,125	0.18
Got in a fight at work or school in the past year	—	—	1,229	0.26
Skipped school in the past year	—	—	1,224	0.42
PIAT raw math score 1996	2,459	45.93 (13.43)	—	—
PPVT raw score 1992	3,703	84.05 (33.04)	—	—
PIAT raw reading comprehension score 1996	2,424	44.20 (13.60)	—	—
Young adult aged 14 at time of interview	—	—	1,341	0.12
Young adult aged 15 at time of interview	—	—	1,341	0.21
Young adult aged 16 at time of interview	—	—	1,341	0.21
Young adult aged 17 at time of interview	—	—	1,341	0.15
Young adult aged 18 at time of interview	—	—	1,341	0.13
Young adult aged 19 at time of interview	—	—	1,341	0.08
Young adult aged 20 or older at time of interview	—	—	1,341	0.11
Child PPVT age in 1992 36 to 52 months	3,899	0.18	—	—
Child PPVT age in 1992 53 to 69 months	3,899	0.20	—	—
Child PPVT age in 1992 70 to 84 months	3,899	0.17	—	—
Child PPVT age in 1992 85 to 99 months	3,899	0.19	—	—
Child PPVT age in 1992 100 to 116 months	3,899	0.16	—	—
Child PPVT age in 1992 117 to 132 months	3,899	0.11	—	—
Mother's age at first birth less than 16	3,899	0.05	1,341	0.22
Mother's age at first birth 17 or 18	3,899	0.11	1,341	0.34
Mother's age at first birth 19	3,899	0.09	1,341	0.17
Mother's age at first birth 20 or 21	3,899	0.20	1,341	0.19
Mother's age at first birth 22 or older	3,899	0.56	1,341	0.09
Grandmother completed less than 12th grade	3,899	0.39	1,341	0.54
Grandmother completed 12th grade	3,899	0.46	1,341	0.37
Grandmother completed more than 12th grade	3,899	0.15	1,341	0.09
Mother resident of South at age 14	3,899	0.31	1,341	0.38
Mother resident in urban area at age 14	3,899	0.78	1,341	0.75
Grandmother in labor force when mother was 14	3,899	0.53	1,341	0.54
Mother lived with both biological parents at age 14	3,899	0.73	1,341	0.67
Mother lived with at least one biological parent at age 14	3,899	0.98	1,341	0.96
Mother lived with single or no parent at age 14	3,899	0.13	1,341	0.16
African-American	3,899	0.15	1,341	0.23
Hispanic	3,899	0.07	1,341	0.07
Female	3,899	0.49	1,341	0.48
First-born child	3,899	0.44	1,341	0.68
Second-born child	3,899	0.37	1,341	0.24
Third- or higher-born child	3,899	0.19	1,341	0.08
Mother's AFQT score	3,899	45.76 (27.18)	1,341	36.67 (24.39)
Number of children in family	3,899	2.69 (1.12)	1,341	2.88 (1.29)

Note: Standard deviations for continuous variables are in parentheses. NLSY = National Longitudinal Survey of Youth; PIAT = Peabody Individual Achievement Test; PPVT = Revised Peabody Picture Vocabulary Test; AFQT = Armed Forces Qualifying Test.

[a]Child data weighted by NLSY child sample weights. Young adult data weighted by NLSY young adult weights.

For each outcome, we first estimate a sparse regression specification with maternal-age-at-first-birth dummies and child age as the only control. We then run a second specification that adds family background controls in order to assess the possible causal responsibility of early parenthood.

To increase our confidence that our second model does not include variables endogenous to early childbearing, we performed a robustness test by removing any child whose mother began childbearing prior to 1980, when the AFQT test was administered. Our results were robust across both specifications.

The consequences of pregnancy may be different for younger teens. To capture potentially important differences between early and late teen childbearing, we include dummies for several age-at-first-birth categories (described previously). We also ran all models with a single teen/nonteen variable coded as 1 if a woman began childbearing before age 19 and 0 otherwise. Results were robust across both specifications.

The results we present in the article show coefficients for our maternal-age-at-first-birth categories compared to the reference group of women who began childbearing at age 22 or later. We chose this reference group because we were interested in whether early childbearing even past adolescence (i.e., at ages 20–21) is associated with negative child outcomes. However, it may be unrealistic to expect policies to induce young women who might have become teen mothers to delay childbearing all the way to age 22. Hence, we were interested in whether delays just into the 20s were associated with improvements in child outcomes. To investigate this question, we reran all of our analyses (results not shown) using childbearing at age 20–21 as the omitted reference category. With the exception of fighting, results were robust across each of the two specifications.

We use linear ordinary least squares regression for continuous dependent variables and multiple logistic regression for dichotomous dependent variables. In all models, we include only the cases that have complete data for the set of regressions containing full background controls. In all cases, standard errors are corrected to accommodate unobserved correlation between mothers in the original NLSY households. Statistical estimates were computed using the STATA software package for personal computers.

It is important to note that our analyses are of effects on children born at any time to women who had their first live birth while in their teens. We chose this approach because teen motherhood may have deleterious effects on the mother that are long-lasting and that are transmitted to all of her children. Some studies suggest that although teen mothers experience initial disadvantages postbirth, they eventually catch up to their later-childbearing peers (Furstenberg, Brooks-Gunn, & Morgan, 1987). If so, one might fear that we are understating teen motherhood effects by including children born later to women who had their first births as teens. To address this possibility, we reran all of our analyses on only first-born children (not shown). These analyses showed no substantial differences in the teen parenthood effects.

Results

The Correlation Between Timing of Motherhood and Children's Outcomes

In models that control only for child age, we find that teen parenthood has a large and statistically significant relationship in the expected direction with almost every studied outcome. Presumably these correlations are what sparked public concern about teen childbearing in the first place. Although our behavioral variables have received less research attention than other outcomes, they yield the same striking pattern of correlations.

We present these models in Table 2. Marijuana use in the previous 30 days is the only variable for which there is no significant baseline correlation with maternal age at first birth. (In analyses not shown, cigarette smoking in the previous 30 days and both marijuana and cigarette smoking ever and 1–2 times per week in the previous 30 days all had no significant baseline correlation with timing of mother's first birth). Early sexual activity, fighting at school or work, and truancy are all positively associated with having a mother who began childbearing in her teens. Children of teen mothers also have lower math, reading, and PPVT scores and are more likely to have repeated a grade in school.

Controlling for Background and Demographic Characteristics

When we include family background controls in models, the story changes strikingly. These results appear in Table 3. On all of the academic variables, which include both the psychometric tests and grade repetition, the magnitude of the teen

TABLE 2. REGRESSION COEFFICIENTS—CHILD'S AGE CONTROLLED

	Dependent Variables							
	Academic				Behavioral			
Independent Variables	Math	PPVT	Reading Comprehension	Grade Repetition	Sex ≤ 16	Marijuana	Fighting	Truancy
Mother's age at first birth								
≤16	−7.48***	−15.22***	−7.33***	1.14***	2.13***	0.24	1.07***	0.30
	(0.87)	(1.22)	(1.00)	(0.35)	0.78	(0.38)	(0.31)	(0.29)
				3.12	8.41	1.27	2.90	1.35
17–18	−4.82***	−11.70***	−5.93***	1.08***	1.88**	0.22	0.82***	0.64**
	(0.74)	(1.05)	(0.82)	(0.33)	(0.76)	(0.36)	(0.31)	(0.28)
				2.93	6.57	1.27	2.27	1.89
19	−3.69***	−8.25***	−4.74***	0.79**	1.20	−0.55	0.42	0.27
	(0.75)	(1.10)	(0.74)	(0.37)	(0.80)	(0.42)	(0.34)	(0.30)
				2.21	3.31	0.58	1.53	1.30
20–21	−3.33***	−5.97***	−3.93***	0.43	0.89	−0.58	0.68**	0.05
	(0.64)	(0.92)	(0.70)	(0.36)	(0.79)	(0.42)	(0.33)	(0.31)
				1.54	2.44	0.56	1.98	1.05
n	2,459	3,703	2,424	1,258	785	1,125	1,229	1,224
Adjusted R^2	0.46	0.77	0.41					
−2 Log Likelihood				1,500.02	1,038.63	1,066.25	1,432.40	1,585.35

Note: Standard errors in parentheses, followed by odds ratios where logistic regressions were run. Dummies for child's age included but not shown. PPVT = Revised Peabody Picture Vocabulary Test.

$*p \leq .10$. $**p \leq .05$. $***p \leq .01$.

TABLE 3. REGRESSION COEFFICIENTS—FAMILY BACKGROUND CONTROLLED

	Dependent Variables							
	Academic				Behavioral			
Independent Variables	Math	PPVT	Reading Comprehension	Grade Repetition	Sex ≤ 16	Marijuana	Fighting	Truancy
Mother's age at first birth								
≤16	−1.21	−0.79	0.66	0.40	2.21***	0.09	0.87**	0.60*
	(0.93)	(1.21)	(1.00)	(0.40)	(0.85)	(0.44)	(0.36)	(0.34)
				1.50	9.14	1.09	2.40	1.83
17–18	0.23	−0.46	0.49	0.58	1.87**	0.09	0.67**	0.79**
	(0.80)	(1.01)	(0.85)	(0.36)	(0.83)	(0.41)	(0.33)	(0.30)
				1.78	6.46	1.10	1.95	2.21
19	0.12	−0.50	0.08	0.50	1.25	−0.50	0.39	0.39
	(0.72)	(0.93)	(0.71)	(0.37)	(0.84)	(0.44)	(0.35)	(0.32)
				1.65	3.48	0.60	1.47	1.48
20–21	−0.60	−0.39	−0.45	0.20	0.88	−0.65	0.63*	0.14
	(0.59)	(0.80)	(0.66)	(0.38)	(0.83)	(0.43)	(0.34)	(0.32)
				1.22	2.41	0.52	1.88	1.14
African American	−2.62***	−7.75***	−1.88***	−0.05	0.50**	0.04	−0.18	−0.49***
	(0.59)	(0.78)	(0.65)	(0.19)	(0.23)	(0.25)	(0.19)	(0.18)
				0.95	1.65	1.04	0.84	0.61
Hispanic	−0.72	−5.15***	−0.18	−0.07	0.12	0.59**	0.01	0.13
	(0.62)	(0.87)	(0.65)	(0.22)	(0.27)	(0.26)	(0.19)	(0.19)
				0.94	1.12	1.80	1.01	1.14
Female	−0.63*	0.40	0.90**	−0.76***	−0.23	−0.18	−0.86***	−0.37***
	(0.38)	(0.46)	(0.42)	(0.14)	(0.15)	(0.17)	(0.14)	(0.12)
				0.47	0.79	0.83	0.42	0.69
Birth order 2	−1.18***	−2.30***	−1.98***	−0.13	0.04	0.14	−0.28	0.01
	(0.44)	(0.53)	(0.47)	(0.16)	(0.18)	(0.19)	(0.17)	(0.15)
				0.88	1.04	1.15	0.75	1.01
Birth order 3+	−1.72***	−4.23***	−4.02***	0.25	−0.25	0.26	0.19	0.11
	(0.65)	(0.86)	(0.73)	(0.25)	(0.32)	(0.29)	(0.26)	(0.27)
				1.29	0.78	1.30	1.21	1.11
Number of children of mother	−0.28	−1.48***	−0.37	0.15**	−0.02	0.05	0.08	−0.07
	(0.21)	(0.30)	(0.23)	(0.06)	(0.07)	(0.07)	(0.06)	(0.06)
				1.16	0.98	1.05	1.08	0.93

TABLE 3. CONTINUED

Independent Variables	Dependent Variables: Academic: Math	Academic: PPVT	Academic: Reading Comprehension	Academic: Grade Repetition	Behavioral: Sex ≤ 16	Behavioral: Marijuana	Behavioral: Fighting	Behavioral: Truancy
Mother's AFQT	0.13***	0.20***	0.14***	−0.02***	0.002	−0.002	−0.01***	−0.0008
	(0.01)	(0.01)	(0.01)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)
				0.98	1.00	1.00	0.99	1.00
n	2,459	3,703	2,424	1,258	785	1,125	1,229	1,224
Adjusted R^2	0.55	0.83	0.49					
−2 Log Likelihood				1,391.82	1,012.08	1,028.93	1,363.83	1,544.69

Note: Standard errors in parentheses, followed by odds ratios where logistic regressions were run. Dummies for child's age, grandmother's education, mother's South/non-South residence, mother's urban residence, mother's household structure, and grandmother in labor force included but not shown. All background characteristics are for when mother was 14. PPVT = Revised Peabody Picture Vocabulary Test; AFQT = Armed Forces Qualifying Test.

$^*p < .10$. $^{**}p < .05$. $^{***}p < .01$.

childbearing effects are greatly reduced, and none remain statistically significant.

A different pattern emerges for the behavioral variables. Teen childbearing effects remain for several variables: whether a child has had sexual intercourse before the age of 16, whether a child has fought at school or work, and whether a child has skipped school. In predicting truancy, the significant coefficient on mother's first birth at age 17–18 from the age-only control model retains significance and actually increases in size in this more fully controlled model. The coefficients for first birth at 16 or under and at 17–18 in predicting sexual intercourse by age 16 also retain significance and size (with a slight increase for first birth at 16 or under). The coefficients are only slightly reduced in size and significance level across models for first birth at 16 or under and at 17–18 in predicting fighting at school or work.

For academic outcomes, we find that gender, race, maternal AFQT, birth order, and number of siblings all have significant effects on at least two of the four outcomes. Girls are less likely to repeat grades and have higher reading comprehension scores. African Americans have lower test scores but are no more (or less) likely to repeat grades. In addition, Hispanic children have lower PPVT scores, although this pattern is difficult to interpret given language concerns.

Maternal AFQT scores are positively associated with all test scores and are negatively associated with grade repetition. Point estimates are large and statistically significant in all specifications. Birth order also has an apparent effect. Compared to first children, second children as well as third or higher-birth-order children had lower scores on all three tests.

For the behavior models, gender, race and ethnicity, and maternal AFQT all had significant effects on at least one of the outcomes. The most striking effects were for race and gender. Female children were less likely to fight or skip school. African American children were less likely to skip school and more likely to become sexually active before age 16. Maternal AFQT slightly lowered the chance of fighting.

Because coefficients from logistic regressions are difficult to interpret directly, we calculated predicted probabilities for the dichotomous outcome variables in Table 3 based on maternal age at first birth. These figures appear in Table 4. We show these calculations only for the models in Table 3. To calculate the predicted probabilities, we took a baseline case of a young adult age 20 or

TABLE 4. PREDICTED PROBABILITIES FOR DICHOTOMOUS VARIABLES BY GENDER AND RACE

	Male		Female	
Dependent Variables[a]	African American	Non-Hispanic White	African American	Non-Hispanic White
Grade repetition				
16 and under	.36	.37	.21	.21
17–18	.40	.41	.24	.25
19	.38	.39	.22	.23
20–21	.31	.32	.18	.18
22 and older	.27	.28	.15	.15
Sex before 16				
16 and under***	.71	.60	.66	.54
17–18	.64	.52	.58	.46
19	.49	.36	.43	.31
20–21	.40	.28	.34	.24
22 and older	.21	.14	.18	.12
Marijuana				
16 and under	.19	.18	.16	.16
17–18	.19	.18	.16	.16
19	.12	.11	.10	.09
20–21	.10	.10	.09	.08
22 and older	.18	.17	.15	.15
Fighting				
16 and under	.21	.24	.10	.12
17–18	.18	.20	.08	.10
19	.14	.16	.06	.08
20–21	.17	.20	.08	.09
22 and older	.10	.12	.04	.05
Truancy				
16 and under	.23	.33	.17	.25
17–18	.26	.37	.20	.29
19	.19	.28	.14	.21
20–21	.16	.23	.11	.17
22 and older	.14	.21	.10	.15

Note: Baseline case is a young adult 20 years of age or older whose mother at age 14 lived in an urban area in the North with both biological parents, whose own mother worked at that time and had less than a high school education, and whose Armed Forces Qualifying Test score was at the mean. The model with family background controlled was used.

[a]Probabilities based on mother's age at time of her first birth.

**p* ≤ .10. ***p* ≤ .05. ****p* ≤ .01.

over whose mother had the following characteristics: at age 14 she lived in an urban area in the North with both biological parents; her own mother worked at that time and had less than a high school education; and her AFQT score (measured in 1980) was at the mean. We show the figures by gender and by race. We do not display results by Hispanic origin, because ethnicity had little apparent effect on most outcomes.

The table shows many large point estimates for the impact of early childbearing on behavioral outcomes. Particularly noteworthy is the association between a mother's early initial childbearing and early initiation of sexual activity among her children. For example, a non-Hispanic White male whose mother began childbearing between 17 and 18 has a predicted probability of having sex before age 16 of .52, compared to only .14 for White males whose mothers delayed childbearing until age 22. There are significant and sizeable differences for fighting and truancy as well. The comparable comparisons are .20 to .12 for fighting and .37 to .21 for truancy.

Delaying Childbearing Just Beyond the Teen Years

Although we use age at first birth over the age of 21 as our reference category in the results we show in the article, we also ran our regressions (results not shown) with initiation of childbearing at 20–21 as the reference category to see if delaying childbearing just beyond the teen years has different effects than teen childbearing. We found the same pattern of results for all outcomes except for fighting. In other words, the children of women who began childbearing in each of our under-20 age categories had no sizeable or significant differences in test scores or grade repetition from the children of those who began childbearing at ages 20–21, but the former groups did have significantly higher levels of early sexual activity and truancy than the latter. Thus, we might expect childbearing delays just past the teen years to diminish these outcomes. For fighting, differences are only evident once childbearing is delayed to age 22 or above.

The Importance of Child's Birth Order and of Number of Children born to Child's Mother

In the literature examining the effects of teen motherhood on children, it is standard to include measures of birth order in models. We include birth order in Table 3 because the two studies most closely aligned to our study chose to do so (Geronimus et al., 1994; Moore et al., 1997). As we examined similar outcomes but in older children using later NLSY data, we wanted to use similar specifications to compare our findings with earlier waves of NLSY data. In addition, birth order has strong effects that are empirically and conceptually different from the effects commonly associated with early childbearing. To separate the effects of birth order from family size, we also include a control for number of children in the data set associated with each mother.

Although one should be concerned that birth order and number of children may be endogenous to teen childbearing (because teen mothers in the sample have more children and therefore are more likely to have a child of higher birth order in the sample), we believe it is appropriate to include these variables separately because they reflect very different family processes that affect child outcomes. Moreover, in our analysis of this data set, birth order appears to have equally important effects for children of older mothers as it does for the children of mothers who initiated childbearing in the teen years.

Although birth order is treated simply as a control, with little or no discussion in the other studies, its effects on academic outcomes are so powerful that we believe it is important to highlight them as well as the effects of number of children in the family. Within Table 3, higher-parity children perform significantly worse on all academic tests. Children with more siblings have lower PPVT scores and are more likely to repeat grades.

Because birth order and number of children in the family are arguably endogenous to maternal age at first birth, and because they have important effects, we ran the models in Table 3 without the two birth order dummy variables and without number of children in the family. The pertinent coefficients from these regressions are shown in Table 5. Note that when birth order and number of children in the family are removed from the regression specification, the coefficients on all variables marking teen childbearing become statistically significant and substantially more negative in predicting the PPVT and PIAT reading comprehension test scores. The effect of very early childbearing (at 16 or earlier) on the PIAT math score also increases and becomes statistically significant.

However, even without birth order and number of children in the model, comparison of Tables 2 (with just child age controls) and 5 indicates that inclusion of background characteristics substantially reduces the effects of early parenting on academic outcomes for children. However, the effects are only driven to zero once birth order is included in the model.

Birth order and number of children do not appear to play the same role in our analysis of behavioral outcomes. When we remove them from the models predicting behavioral outcomes shown in Table 3, the pattern of coefficients on maternal age at first birth is substantially unchanged. These coefficients are also shown in Table 5.

Alternative Approaches

For the outcomes in which a teen childbearing effect remained after the inclusion of extensive controls, we attempted several additional techniques (results not shown) to address potential unmeasured heterogeneity. However, inadequate statistical power eliminated the possibility of using each of these approaches to produce convincing results. We computed fixed-effects cousin comparison models for all outcomes. In all cases, we obtained small point estimates from these models; however, the accompanying standard errors were large enough to permit clinically significant effects. We also attempted to compare the children of women who began childbearing as teens and the children of women who experienced miscarriages as teens and their first live births after their teen years. Finally, we tried to use age at menarche as an instrument. In both the miscarriage comparisons and the instrumental variables analyses,

TABLE 5. REGRESSION COEFFICIENTS—BIRTH ORDER AND FAMILY SIZE NOT CONTROLLED

	Dependent Variables							
	Academic				Behavioral			
Independent Variables	Math	PPVT	Reading Comprehension	Grade Repetition	Sex ≤ 16	Marijuana	Fighting	Truancy
Mother's age at first birth								
≤16	−2.83***	−6.02***	−2.65***	0.60	2.17***	0.26	0.91***	0.55*
	(0.84)	(1.08)	(0.93)	(0.38)	(0.84)	(0.42)	(0.34)	(0.32)
				1.83	8.74	1.30	2.47	1.74
17–18	−1.01	−3.89***	−1.94**	0.64*	1.85**	0.19	0.64**	0.77***
	(0.73)	(0.92)	(0.79)	(0.35)	(0.83)	(0.39)	(0.33)	(0.30)
				1.91	6.38	1.20	1.90	2.17
19	−0.82	−3.20***	−1.79***	0.55	1.24	−0.43	0.38	0.37
	(0.66)	(0.88)	(0.68)	(0.37)	(0.84)	(0.44)	(0.35)	(0.32)
				1.74	3.44	0.65	1.46	1.44
20–21	−1.21**	−2.22***	−1.67***	0.21	0.86	−0.62	0.61	0.13
	(0.57)	(0.78)	(0.64)	(0.38)	(0.83)	(0.43)	(0.34)	(0.32)
				1.23	2.43	0.54	1.84	1.13
N	2,459	3,703	2,424	1,258	785	1,125	1,229	1,224
Adjusted R^2	0.54	0.83	0.48					
−2 Log Likelihood				1,403.27	1,013.03	1,030.91	1,370.76	1,546.68

Note: Standard errors in parentheses, followed by odds ratios where logistic regressions were run. Dummies for child's age, race, gender, mother's AFQT score, grandmother's education, mother's South/non-South residence, mother's urban residence, mother's household structure, and grandmother in labor force included but not shown. All background characteristics are for when mother was 14. PPVT = Revised Peabody Picture Vocabulary Test; AFQT = Armed Forces Qualifying Test.

$^{*}p \le .10$. $^{**}p \le .05$. $^{***}p \le .01$.

we lacked adequate sample size to obtain usable results.

Discussion

Study Limitations

Our goal was to investigate the causal role of teen childbearing itself as opposed to identifying a full range of the factors that cause the child outcomes in question or mediate between teen childbearing and the outcomes. Thus, we do not present a detailed longitudinal picture of the evolving family environment available to children. For example, we expect that both changing household composition and changes in family income over time may play an important role. Paternal age and involvement and neighborhood, peer, and community factors are also of likely importance. A cross-sectional analysis is sufficient to determine whether the children of teen mothers experience adverse outcomes (indeed, inclusion of dynamic factors after the child's birth would be endogenous). It is not sufficient to provide a rich causal explanation of any resulting teen parent effects.

Although we have good measures for mothers' academic ability and several features of her socioeconomic background, we have less extensive data regarding other parental skills, attitudes, and resources that may influence behavioral outcomes. Factors such as both maternal and paternal disciplinary style, mental health, and role model effects may be especially important in predicting child behaviors, yet these are more difficult to measure in feasible survey data. It is possible that these more subtle characteristics and behaviors may also be correlated with self-selection by young men and women into the role of teen parenting.

Although the NLSY is a high-quality data set, it nonetheless contains anomalies, inconsistencies, and likely misreporting. We performed extensive data cleaning to address these issues, but some data quality issues remain. As in most studies of hidden or stigmatized behavior, we rely on potentially unreliable self-reports. Our two reports of male pregnancy highlight the additional problem of adolescent whimsy and deliberate false reports. The study design of the NLSY also limited available data. We have less extensive data regarding initial life circumstances for children born before the initial 1979 survey wave than we do for children born in later years.

NLSY study design has a particularly strong impact on our resulting sample of adolescent and young adult children of the original NLSY cohort. Most NLSY children in the adolescent and young adult sample are still relatively young (in the mid-teen years). The adolescents and young adults with available 1996 data are disproportionately born to teenage mothers (often young teenage mothers), and hence they are not fully representative of the population of similar-aged teens. In addition, given the age restrictions in the original NLSY sample, no mothers of the adolescent and young adult sample initiated childbearing after the age of 24. In terms of the behavioral effects we find, this sample creates a conservative test, as the inclusion of later child bearers would likely increase and not diminish estimated effects of early childbearing. The mothers in the test score analyses could have started childbearing as late as their mid-30s.

We employ age and period controls to ameliorate resulting potential biases. However, the age structure appears to be an intrinsic limitation of the NLSY.

Our study contains several other limitations. AFQT is measured after the first birth for a small proportion of women, complicating proper causal interpretation of this variable. Analysis of post-1980 births suggests that this limitation does not appreciably change our point estimates. However, our limited sample size prevents us from exploring this issue in greater depth.

Interpreting the Results

Compared with other children and young adults in the NLSY sample, children of teen mothers were more likely to score poorly on tests of academic skill, to be retained in school, to initiate early sexual activity, and to display problem behaviors such as truancy and fighting. We found no zero-order correlation between timing of first birth and a child's use of tobacco or marijuana. For the outcomes correlated with timing of motherhood, children of young teen mothers displayed worse outcomes than did children of teen mothers who experienced later first births.

Although teen childbearing is a powerful *marker* for adverse outcomes, it appears to play little or no causal role for the academic outcomes we measure. Controlling for maternal background factors, maternal age at first birth has no statistically or clinically significant association with performance on standardized academic tests or with the probability of grade retention in school. (However, teen parenthood is related to birth order and number of children in the family, which are in turn related to test scores.) We found a different pattern for the behavioral outcomes. For early sexual initiation, truancy, and fighting, the relationship with teen motherhood survives inclusion of extensive background controls. Thus, different child outcomes appear to be influenced by different causal pathways and different characteristics of the family and home environment.

Our findings regarding academic outcomes are consistent with those of Geronimus et al. (1994), who studied a younger sample of children. The Geronimus et al. analyses left open the possibility that teen childbearing is associated with long-term differences in academic outcomes for children. Our analysis of more recent data that include older children finds no such detrimental effect. Additional analysis of one key measure—children's grade retention in school—yielded the same results. For academic outcomes, public alarm over teen childbearing itself seems misplaced. However, our results for birth order and number of children in the family may indicate that curtailing family size may have some benefits. Given the age of our sample, we do not examine high school completion rates. Haveman et al. (1997) do find teen parenthood effects on children's probability of graduating from high school.

Our findings, like those of Geronimus and her colleagues (1994), diverge from the findings of Moore et al. (1997), which show effects of early childbearing on academic outcomes using the same 1990 NLSY data as Geronimus et al. Our different results appear to reflect our inclusion of mothers' AFQT scores as a predictor of children's academic performance. When we remove AFQT from the models, we too find effects on the academic outcomes. AFQT's strong effects are likely due to a combination of factors. AFQT scores reflect maternal genetic endowment to some degree, but because scores are also affected by environment and education (see Winship & Korenman, 1997), they may capture some of the socioeconomic differences between teens that contribute to selection into early childbearing. Because of assortative mating, scores also partly serve as proxy for paternal genetic and socioeconomic background (Phillips, Brooks-Gunn, Duncan, Klebanov, & Crane, 1998). Because we are interested in the effects of early parenting independent of parental cognitive ability and the environmental factors associated with AFQT scores, we believe it is appropriate to include AFQT in these regressions.

Like the previous articles, we included birth order in our analyses—another important variable correlated with early childbearing. Indeed, although teen parenthood net of family size and a child's birth order does not appear to predict academic test scores of children, it does appear to play a role in these outcomes through its relation to family size.

Our findings of teen parenting effects on behaviors are consistent with studies of related adolescent and young adult outcomes. For instance, Grogger (1997) finds that net of background factors, male children of teen mothers have slightly higher incarceration rates than the sons of older mothers. Similarly, Haveman et al. (1997) find that teen motherhood effects on a daughter's chances of becoming a teen mother survive the inclusion of background factors in models. Our findings lend support to the hypothesis that early parenting plays some causal role in problem adolescent behaviors. However, our results are also consistent with the possibility that unmeasured factors correlated with early parenting account for the observed effects. Although fixed-effects cousin comparisons eliminated teen childbearing effects on behavioral outcomes, the standard errors were too large to reject the possibility of clinically important effects.

Our current methodology does not allow us to examine *why* teen parenting might have harmful effects. Early childbearing is strongly correlated with reduced economic well-being, particularly during the early childhood years. This economic consequence may deny children important material resources needed for successful development and psychological well-being. Although such income effects are certainly plausible, Mayer (1997) argues that this direct material route cannot fully account for the observed variation in child outcomes. In analyses not shown here, we find that early parenting effects survive the inclusion of a rudimentary income measure, a finding consistent with Mayer's argument. However, we hope in future work to provide a more systematic income analysis to explore these questions.

It is also possible that young mothers do not have the maturity and life experience or social supports necessary for highly developed parenting skills. Without these skills, young mothers may not be able to shape appropriately their children's activities and behavior. If children's academic performance is particularly shaped by innate ability, by the quality of school inputs, and by parents' basic academic skills, it is possible that immature parenting styles or overstressed parents have a larger impact on problem behaviors than they do on children's academic skill.

The fact that higher-birth-order children have worse outcomes in our models may be interpreted as evidence against the parenting skills argument, because arguably women should have time to develop parenting skills by the time they have additional children. However, these positive effects could be overshadowed by the increased parental stress additional children can bring.

A third possibility is that young parents themselves may be more ambiguous role models in discouraging certain behaviors. Children may mimic their parents' past behavior, which includes early sexual activity.

The relationship between early childbearing and child outcomes alternatively may be mediated not by any of these individual factors but by social structures, such as neighborhood context and the peer groups of children, that may result from teen parenting. If, for instance, early parenting ties women disproportionately to disadvantaged neighborhoods through effects on income, breadth of social networks, or some other mechanism and if neighborhoods do indeed affect child outcomes, then the negative child behaviors we measure may result. This scenario is distinct from arguments about the causal role of teen mothers' socioeconomic background. Here, the focus is on contextual disadvantages that stem from early parenting itself as opposed to prior such disadvantages that may lead to adolescent motherhood. We plan to investigate the role played by these possibly mediating paths in future work.

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