Early Childbearing and Children's Achievement And Behavior over Time

CONTEXT: *Compared with children of older women, children of women who had their first birth during their teens have long been believed to be at higher risk for a host of poor health, social and economic outcomes. Recent studies have failed to confirm this belief, but none have taken into account whether children's outcomes or the effects of early childbearing on those outcomes have changed over time.*

METHODS: *Data from the National Longitudinal Survey of the Labor Market Experience of Youth and the Panel Study of Income Dynamics are used to separate the influence of changes from the 1960s through the 1990s in children's experiences from the effect of mother's age at first birth.*

RESULTS: *Multivariate analyses controlling for social and demographic characteristics show that among children born to women from a particular birth cohort, those whose mothers first gave birth in their teens have significantly lower scores on a set of four achievement tests and significantly higher scores on a behavior-problem index than do children whose mothers delayed childbearing. However, when changes over time in children's outcomes and in the effect of early childbearing on those outcomes are taken into account, children born to women who began childbearing early score significantly worse than those whose mothers delayed their first birth on the behavior-problem index, but on only one achievement test.*

CONCLUSIONS: *Comparisons by age at first birth among women born in the same period may misestimate the effects of early motherhood. Whether early childbearing's effects on children are overestimated or underestimated depends on whether test scores are rising or falling. Policymakers should be cautious in making decisions based on studies that do not take time trends into account.*

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Most studies find that children of teenage parents are at greater risk than children of older parents for a host of health, social and economic disadvantages.[1] As a result, they score lower on standard intelligence tests and achievement evaluations.[2] Their risk is elevated partly because their mothers are disadvantaged to begin with and partly because their mothers tend to attain less schooling, to remain single or to have unstable marriages, and to have more children than average. Other research, however, suggests that there is no difference or even that children of younger mothers have certain advantages.[3] The relationship between a teenage birth and disadvantage becomes small or disappears altogether once controls are introduced for background differences and intervening factors.[4] The exact mechanisms that affect children may differ at different times and for different outcomes; for example, biological factors may operate on health at birth, while environmental factors may affect cognitive and social development.[5] This conundrum has yet to be well described, let alone explained.

Most analyses examining the effects of teenage childbearing on children have used the National Longitudinal Survey of the Labor Market Experience of Youth (NLSY), a cohort of youth first interviewed in 1979, when they were aged 14–21. Because this research was conducted using data collected in the 1980s, most comparisons are between teenage mothers and women who had a first birth in their early 20s. However, first children born to women aged 20–21 may also suffer some of the detrimental effects associated with teenage childbearing.[6] Thus, these comparisons may have underestimated the effects of early childbearing. It is important to replicate these earlier analyses to see whether the results are the same when the full range of ages at first birth is used.

In addition, it is important to determine whether the results are affected by the limitations of available data. The appropriate comparison is between all children of all women (regardless of age at first birth) who bore a first child in a given time period. Yet, the NLSY data set requires pooling children born to teenage women in the 1970s with children born in the mid-1990s to first-time mothers in their 30s. The circumstances surrounding giving birth in the 1970s may be very different from those today. In analyses of the effect of maternal age, the age of the mother is confounded with the period of observation. Effects found in analyses that do not control for differences in birth periods may result from a changing environment rather than from varying maternal age.

Some researchers argue that as the women in a cohort

study such as the NLSY enter their 40s, data on newborn children can be added, to allow comparisons between all children born to teenage mothers and all those born to later childbearers.[7] The validity of this approach is dependent on the assumption that neither the outcomes for children nor the effects of teenage childbearing change over time. Because NLSY respondents whose first birth occurred in 1980 were considerably younger than those who first gave birth in 1995, analyses using the survey data cannot separate the effect of maternal age from that of historic period.

This article examines the implications of period change for the consequences for children of having been born during their mother's teenage years. Do children's achievements change over time? Do the effects of timing of childbearing on children's achievements vary by whether the first birth occurred in the 1970s, 1980s or 1990s? We attempt to answer these questions by constructing a data set comparable to the NLSY from the Panel Study of Income Dynamics (PSID), which includes data on early and later childbearers in the same historic periods.

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TIMING OF CHILDBEARING

It has long been believed that an early birth disadvantages a young mother's children as well as the woman herself. One key reason is that early childbearing interferes with the process of schooling and human capital development, which means that the mother's ability to garner resources will be reduced. She is much more likely to be poor than is a woman who delays childbearing, for example.[8] This may prevent her from providing resources that promote cognitive development, such as a high-quality child-care arrangement and a stimulating home environment.

Second, because young mothers are socially and emotionally immature, we would expect them to have limited parenting ability. Coping with the demands of an infant is likely to be far more challenging for a teenager than for an older woman.[9] Inconsistent and arbitrary discipline, which is more common among young mothers, has a negative impact on children's behavior and on their social and emotional development.[10] As a result, we expect a young age at first birth to adversely affect children's social and emotional adjustment. Even if a teenage mother has additional children when she is older, she may continue the patterns of parenting she established with her first child. Teenage mothers also tend to provide their children with less cognitive stimulation and less emotional support than do older mothers: One study found that scores on a global measure of parenting were lower for the homes of children of teenage parents than for the homes of other children.[11]

Recent evidence, however, suggests that the negative effects of teenage childbearing may not be as strong as previously believed.[12] There are several potential reasons.

First, women who have a child at a young age differ initially from those who do not. Their mothers' education is lower, they are more likely to come from a single-parent family and they have more siblings.[13] Such young women are less likely to delay sexual activity, and are more likely to bear and raise a child if they become pregnant.[14] Given these disadvantages, even if they delayed childbearing, their children might not be better off.

In addition, early childbearing may have advantages for physical well-being, because both adolescents and their children tend to be quite healthy. From this perspective, being born to an adolescent mother may not be a disadvantage, particularly if she received adequate prenatal and postnatal care.[15]

Researchers have used a variety of methodological techniques to control for factors that influence both achievement and early childbearing. Controlling for observed factors reduces the relationship between teenage motherhood and measures of vocabulary recognition (the Peabody Picture Vocabulary Test), math and reading comprehension (the Peabody Individual Aptitude Test), and behavior problems.[16] In one study, the introduction of such controls eliminated the relationship in the case of the math and reading comprehension tests.[17]

Some factors associated with early childbearing, however, cannot be measured. Controlling for unobserved factors common to siblings reverses the direction of the effect of a teenage birth, so that children of young mothers do better than children born to older mothers on the vocabulary, math and reading comprehension tests.[18]

Researchers have puzzled over these results for some time; the only explanation proposed is that previous studies misestimated the effects of early childbearing because they left out important observed variables, such as maternal ability or birth order,[19] or unmeasured family factors.[20] We propose, instead, that period effects are the key omitted variables.

First, we hypothesize the existence of a pure period effect. If children's test scores and behavior are changing over time, and we compare teenage mothers in an earlier period with adult childbearers in a later period, we cannot be sure whether we are estimating the effect of early childbearing or the effect of period changes in scores. If test scores are declining, the children of teenage mothers may appear similar to those of later childbearers because the former were assessed in a period when scores were higher; any disadvantage resulting from young maternal age may be offset by the period effect. If scores are rising, the children of later childbearers will have the advantage, not only because they were born to older mothers, but also because the scores of all children are higher. Increases in test scores over time should lead to improvements in scores for all children, but should not necessarily result in advantaging or disadvantaging the children of teenage mothers as long as comparisons are made within the same period.

Data from the National Assessment of Educational Progress document significant increases in the math and reading test scores of children aged nine and 13 from the early 1970s to the mid-1990s.[21] Because immigration and other factors are continually altering the makeup of the overall population of schoolchildren, changes could result from compositional factors. For example, math and reading test scores rose more for black children than for white children,

while reading scores increased for children of parents without a high school degree but not for those whose parents had no schooling after high school. Typical analyses of teenage childbearing ignore these period changes.

Second, historic circumstances may alter the disadvantage of early childbearing. It will be impossible to estimate the effect of having a mother who first gave birth as a teenager if the comparison condition is having a mother who first gave birth as an adult during a different time period. Before 1975, the consequences of teenage childbearing were severe. Teenage mothers were ostracized and forced to leave school; often, they remained in their parents' home and shared child-care responsibilities with their mother. Because parental schooling is a crucial factor in early language development, this curtailment of a teenage mother's education (in combination with her mother's likely low level of schooling) would have made it difficult for her to provide the cognitive stimulation needed to develop her child's verbal and math abilities. The implementation in 1975 of Title IX of the Educational Amendments Act effectively eliminated pregnancy as a legitimate reason for school expulsion, although indirect or informal pressures might accomplish the same end.

Today, some observers argue, norms have changed and informal pressure to drop out or otherwise conceal a pregnancy has disappeared.[22] Numerous programs are available to help teenage mothers improve their academic skills and raise their children.[23] Moreover, high-quality child-care programs may improve children's academic and social skills.[24] To the extent that social pressures, institutional barriers and lack of community supports led young mothers to drop out of school in the past, we would expect changes leading to greater school retention and program enrollment to decrease the effects of an early birth on children's cognitive development over time.

Although cognitive achievement is likely to have risen among the children of young mothers, their social adjustment may not have improved. After a large increase in public assistance rolls in the 1980s, the policy environment changed. The early 1990s was a period of retrenchment in cash assistance programs; many states implemented requirements for mothers of even very young children to work or attend school.[25] Child-care funding increased, but child-care assistance still reaches only 10–15% of eligible mothers.[26] Consequently, the effect on children of being born to a teenage mother may again increase. Entering employment or school while caring for young children is stressful; for teenage mothers, who typically have many personal and family problems, it could lead to behavior problems among their children. One study found that children exhibited increased behavior problems during the period immediately after their mother stopped receiving welfare.[27]

In sum, the effect of an early first birth is likely to have changed over time, which explains the differential effects others have found in the various data sets of the National Longitudinal Surveys.[28] In periods in which the children of teenage mothers receive substantial supports, such as welfare, child care and health assistance, we might not expect a teenage birth to have a strong effect.

Although we may have reason to expect consequences to differ by when the first child was born, we have less reason to expect differences by when the mother was born; because previous research bears this out,[29] we focus on the period in which the mother had her first birth.

Including all births rather than only first births does not change the effects of teenage childbearing.[30] This finding suggests that a woman's ability as a mother may be determined by the age at which she first gives birth. Therefore, we focus on the mother's age at first birth, not her age at the birth of each child. Because we include all children born to women in the sample, not all children of teenage mothers were born during their mothers' teenage years.

We examine whether the effects of early childbearing on the cognitive, social and emotional development of children of mothers who had a first birth in the late 1960s differ from the effects on children of women whose first child was born in the late 1970s, early 1980s or early 1990s. Our analyses cut across the early Vietnam War years (1966–1972), the baby-bust period (1973–1979), the conservative 1980s and the welfare reform period of the early 1990s. No research has tested the hypothesis that historic period influences the effects of early childbearing on children's outcomes. The availability of new data on a representative cohort of children of all ages and information on their mothers' fertility now allows us to investigate this hypothesis.

Of the two data sets used in this analysis, the NLSY is the "gold standard," as it has been used extensively to document the consequences of teenage childbearing for young women.[31] However, it represents only a single birth cohort and thus does not permit comparisons of women who gave birth as teenagers during different historic periods. The PSID has also been used to look at teenage childbearing.[32] It includes many birth cohorts, but the number of women in each cohort is relatively small. To the extent that these two data sets provide similar pictures of the same cohort, the PSID can be used to depict period trends.

First, we will use both data sets to compare the effects of a teenage birth on child development. We will then use the PSID to estimate the effect of the interaction of teenage childbearing with period of first birth.

DATA AND METHODS

The NLSY

The NLSY is an ongoing longitudinal survey of a cohort of youth who were aged 14–21 on December 31, 1978. Respondents were followed annually through in-person or telephone interviews until 1994, and have been interviewed every other year since then. In 1994, the cohort included 4,480 females, of whom 3,464 had had children. In 1986 and every two years thereafter, mothers have been interviewed about their children, and the achievement of children aged three or older has been directly assessed through standardized tests. Our analyses are based on data collected through 1996 (to make the years covered comparable to

those of the 1997 PSID Child Development Supplement) and include all respondents born between 1957 and 1964.

Rates of response to the NLSY have been quite high, reaching at least 90% each year through the 1994 wave. Not all respondents were interviewed in every study year; by 1996, 70% of the women had been interviewed in every wave, with 85% interviewed in at least 15 waves. Weights that adjust for the probability of selection and for differential levels of attrition are used throughout.

The PSID

The PSID is a longitudinal survey of a representative sample of U.S. men, women and children and the families in which they reside. Data on employment, income, wealth, housing, food expenditures, transfer income, and marital and fertility behavior have been collected annually since 1968. From 5,000 families in 1968, the survey has grown to include more than 8,500 core families in 1995; children and other sample members become respondents in their own right when they leave the original household.

In 1997, a supplementary set of questions was asked of parents with children younger than 13. The Child Development Supplement used standardized measures of achievement to assess children's development and obtained indicators of mental health through parental reports of children's behavior.[33] This article uses PSID data from 1968 through 1997 on females born between 1946 and 1966 who responded to the PSID Child Development Supplement.*

An ongoing concern of analysts is whether the PSID is still a nationally representative sample, given that more than 30 years have passed since the original sample was selected. Although 96–97% response rates have been attained each year, about half of the original respondents remained in the study (60% if adjusted for mortality) after 30 years. Because of such concerns, the PSID is weighted to adjust for the initial probability of selection into the sample plus annual attrition. In addition, the PSID has conducted many methodological studies, none of which has found that attrition biases the sample when the appropriate weights are used.[34] The PSID now contacts and interviews sample members who have dropped out, focusing on recent dropouts. Weights adjusting for differential selection and attrition are used in our analyses; these weights are normalized so that statistical tests reflect actual sample sizes.

Dependent Variables

We are particularly interested in two types of outcomes. Scores on four subtests of the Woodcock-Johnson Revised Test of Achievement are used as measures of cognitive achievement. These tests include letter-word identification, a measure of children's ability to identify and respond to letters and words; passage comprehension, which measures vocabulary and comprehension skills; calculation, which scores performance on mathematical calculations; and applied problems, which measures skill in analyzing and solving practical numerical problems.[35]

Children's social and emotional adjustment is examined in this study through the Behavior Problems Index, which was developed by Peterson and Zill to assess, in a survey setting, the incidence and severity of child behavior problems.[36] The overall scale is divided into two subscales, one measuring withdrawn or distressed behavior ("internalizing" problems) and the other measuring aggressive behavior ("externalizing" problems). Many of the items come from the Achenbach Behavior Problems Checklist.[37] The scales were standardized in the NLSY, but not in the PSID, so the scores differ even though the items are identical.

Independent Variables

The major independent variables are the age at first birth of the young woman and the period of her first birth. We compare women who had a first birth at age 19 or younger with women whose first birth occurred at age 20 or later. Although children of 20–21-year-olds may experience some of the negative consequences experienced by children of younger mothers, we follow convention in dividing the sample at age 19 because public policymakers are unlikely to treat the childbearing decisions of 20–21-year-olds in the same way as those of younger women.†

In the PSID, period of first birth is divided into six five-year categories from 1966–1970 (the omitted category) through 1991–1995. We also examine whether the effect of age at first birth varies by period, modeled as interactions between birth period and age at first birth.

This analysis focuses on the total effects of teenage childbearing on children's achievement. We control only for background characteristics of the mother—her number of siblings, her mother's education and employment status, and her family structure when she was 14. Less-educated mothers are likely to have a limited vocabulary, and their children's vocabulary is probably restricted as a result. Such mothers are less likely to be able to assist their children with homework or to promote learning and school achievement as valued objectives. We would expect mothers with more children to spend less time with each one, and the achievement of their children may suffer as a result.[38]

In the other analyses, including controls for education, family size and birth order in models of children's achievements reduces the effect of early childbearing to nonsignificance.[39] Such controls, however, are not appropriate in our model. If early childbearing curtails the schooling and increases the family size of teenage mothers, and children's achievement is reduced as a result, we consider this an impact of early childbearing, albeit indirect. Although early childbearing can affect children's achievement through factors other than education and family size—including the quality of the home environment[40]—we do not control for

*This sample was selected to represent women born in the post–World War II baby boom or later, and to provide a large set of cohorts that were contemporaries of the NLSY cohort.

†We created a dummy variable that equals one if a mother first bore a child before age 18 and another that equals one if a mother first bore a child at ages 18–19. The findings for 18–19-year-olds did not differ from those for younger teenage mothers.

these variables. We assume that differences in these mediating factors may explain some of the effects of teenage childbearing on achievement, but we do not attempt here to sort out the various causal pathways.

The same reasoning holds for maternal ability. In one study, scores on a measure of maternal ability were strongly linked to children's achievement test scores.[41] Although such a variable is available in an early wave of the NLSY, it is not available for all mothers in the PSID Child Development Supplement, thus limiting the size of the PSID sample. In addition, this item was included in 1997, in many cases years after the first birth. Because it was important to have comparable data for the two samples, we could not use maternal ability.*

Because children's achievement varies by race and ethnicity,[42] we identify mothers as Hispanic, black or nonblack non-Hispanic, using either their response to the screener item for racial or ethnic origin (NLSY) or their responses to items on racial origin and Spanish descent (PSID). The Hispanic sample of the NLSY differs from that of the PSID, with the former including a sample of more recent adult immigrants to the United States. (The PSID added an immigrant sample in 1997.) Because we want the samples to be as similar as possible, Hispanics are excluded from the analyses. Background variables include the woman's family structure and her mother's employment status when the woman was 14, her mother's education, and region of residence. The analyses include the age of the child when assessed (to control for any differences not adjusted for in standardization of test scores). We controlled for gender differences in test scores, which are common, by including a dummy variable for gender.

Methods

For our analyses, we modified a common statistical model to take intergenerational effects into account.[43†] This model omits the period of first birth; it is equally plausible to include it. In the NLSY, the period of first birth is strongly correlated with maternal age at first birth. The period of birth, we hypothesize, is also strongly correlated with the child's achievement and behavior. Because period is part of the error term, the effects of a first birth are correlated with the error term in most statistical models using the NLSY; therefore, the effects of age at first birth are biased. The amount of bias is the effect of period of first birth times its partial correlation with age at first birth.[‡] If period and age at first birth are not correlated, there will be no bias. Unbiased estimates can be obtained using a data set such as the PSID, in which period of first birth and age at first birth are not confounded.

Our approach is to estimate the effects of early versus later childbearing on achievement and behavior using ordinary least-squares techniques for continuous dependent variables. We cannot compare sibling achievement and behavior, because siblings do not differ in maternal age at first birth. Cousin comparisons require too strong an assumption about the similarity of children's experiences.

TABLE 1. Mean scores (and standard deviations) on children's achievement and behavior-problem tests, by data set, according to mother's age at first birth, Panel Study of Income Dynamics (PSID) and National Longitudinal Survey of the Labor Market Experience of Youth (NLSY)

Data set and test	N	All mothers	Teenage mothers	Adult mothers
PSID				
Letter-word identification	1,721	105.8 (18.0)	97.5 (13.5)	107.9 (18.9)
Passage comprehension	1,221	106.4 (16.2)	98.2 (12.9)	108.6 (16.7)
Calculation	1,214	103.3 (17.8)	95.5 (15.4)	105.4 (18.0)
Applied problems	1,711	109.1 (17.5)	100.0 (13.7)	111.5 (18.0)
Behavior-problem index	2,144	8.3 (5.9)	9.3 (5.6)	8.0 (6.0)
Internalizing	2,144	2.5 (2.7)	2.8 (2.5)	2.4 (2.7)
Externalizing	2,144	5.8 (3.9)	6.5 (3.6)	5.5 (4.0)
NLSY				
Math	2,855	103.6 (13.6)	98.3 (11.2)	105.1 (14.1)
Reading recognition	2,847	106.2 (14.5)	100.5 (12.7)	107.8 (14.7)
Reading comprehension	2,307	103.0 (13.0)	97.1 (11.1)	104.9 (13.2)
Picture vocabulary	1,880	97.9 (17.6)	89.3 (15.5)	100.2 (17.7)
Behavior-problem index	3,064	103.5 (15.0)	106.7 (14.5)	102.6 (15.1)
Internalizing	3,224	102.1 (15.2)	104.0 (14.5)	101.5 (15.5)
Externalizing	3,138	103.0 (14.7)	106.3 (14.3)	102.1 (14.7)

In previous research, the effects of teenage childbearing on maternal education were consistently negative. These effects were only slightly weaker in sibling models than in ordinary least-squares and logistic regressions.[44] Given these findings, we are less concerned about bias due to unmeasured factors other than period. We first estimate the effects of a model using the NLSY, in which period and age at first birth are confounded. We then estimate the same model using the PSID, in which age at first birth varies within period over a longer series of periods.

This study has one important limitation: In the PSID data, birth period is confounded with the child's birth order. Firstborn children of mothers who had a birth in the late 1960s or the 1970s, for example, are too old to be in the 1997 Child Development Supplement data set; consequently, the children of such mothers who are included in the data set are not firstborn children. Thus, we are comparing consequences in early periods for later-born children whose mother was a teenage childbearer with consequences in later periods for first and later children. Although research has found the consequences of early childbearing to be similar for first and later children,[45] this assumption is not testable with these data and may not apply. Unfortunately, we cannot overcome this limitation; therefore, we focus on trends in children's scores beginning in the 1980s.

*This limitation is not a major problem, because the earlier analysis did not find that inclusion of maternal ability in itself eliminates the effect of early childbearing on children's achievement.

†The model is $Y_{ijk}=\alpha X_{ik} + \beta AFB_{jk} + \mu_{ijk}$ where Y_{ijk}= human capital, X_{ik}=grandmother's behaviors, AFB_{jk} = mother's age at first birth, u_{ijk}= omitted variables (endowments not under parental control), and i=grandmother, j=daughter and k=child. For maternal behaviors, we have substituted grandparents' family background factors (such as grandmother's employment, family structure in the grandparents' home and race). These factors are hypothesized to be correlated with maternal human capital and, therefore, maternal behaviors such as schooling, childbearing and marital decisions. There is a second, equally plausible, model: $Y_{ijk}=\alpha X_{ik} + \beta AFB_{jk} + \gamma P_{jk} + \mu_{ijk}$, where P_{jk} = the period in which the first birth took place.

‡$E(\hat{B})=B+\gamma d_{32}$, where d_{32} = partial correlation between B and γ.

TABLE 2. Coefficients from logistic regression models using different sets of controls to assess the effect of maternal age at first birth on children's achievement and behavior-problem test scores, PSID

Age, period and interaction between age and period	Achievement test								Behavior-problem index					
	Letter-word identification		Passage comprehension		Calculation		Applied problems		Total		Externalizing		Internalizing	
	Model A	Model B	Model A	Model B	Model A	Model B	Model A	Model B	Model A	Model B	Model A	Model B	Model A	Model B
Teenage first birth	–6.4**	0.1	–8.0**	–15.6**	–7.0**	8.5	–8.7**	–7.6	0.9**	7. 9**	0.8**	4.9**	0.2	3.0**
Period of first birth†														
Early 1970s	na	8.2	na	–0.3	na	1.1	na	–0.2	na	–0.0	na	–0.5	na	0.4
Late 1970s	na	0.2	na	–4.9	na	–1.8	na	3.0	na	1.4	na	1.0	na	0.5
Early 1980s	na	2.7	na	–2.4	na	3.0	na	6.1**	na	0.2	na	–0.1	na	0.4
Late 1980s	na	7.9**	na	3.6	na	6.0*	na	5.8**	na	0.5	na	0.0	na	0.4
Early 1990s	na	3.4	na	–7.1*	na	2.0	na	5.0*	na	0.9	na	0.5	na	0.4
Period of teenage first birth†														
Early 1970s	na	–13.5	na	7.5	na	–14.2	na	4.0	na	–7.3**	na	–4.4**	na	–2.8**
Late 1970s	na	–5.0	na	11.5	na	–11.6	na	–0.1	na	–9.2**	na	–5.8**	na	–3.4**
Early 1980s	na	–5.0	na	8.2	na	–14.1	na	–2.0	na	–7.4**	na	–4.3**	na	–3.1**
Late 1980s	na	–10.5	na	6.8	na	–19.5*	na	–2.2	na	–6.1**	na	–3.7**	na	–2.5**
Early 1990s	na	1.5	na	–1.7	na	–3.5	na	3.3	na	–6.7**	na	–4.0**	na	–2.8**
Intercept	*88.3***	*83.2***	*100.5***	*99. 6***	*105.0***	*99.5***	*104.6***	*98.9***	*9.0***	*8.3***	*7.9***	*7.5*	*1.1***	*0.7***

*p<.10. **p<.05. †The reference period is the late 1960s. *Notes:* Both models control for race, gender, age, grandmother's education and employment, number of maternal siblings and family structure. Model B controls for period of first birth and the interaction between age at first birth and period of first birth. na=not applicable.

RESULTS

Means by Age of Mother at First Birth

The effects of teenage childbearing on child development and behavior are consistent across the two data sets (as well as with simple means obtained in other analyses[46]). In comparison with the children of women who became mothers as adults, the children of teenage mothers score lower on achievement tests and higher on behavioral problems (Table 1, page 45). We do not control here for differences between early and later childbearers that may contribute to differences in test scores and behavior.

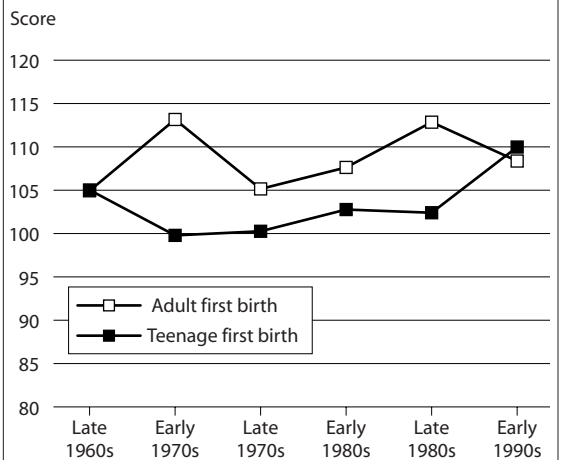
Multivariate Analyses

In our next step, we use PSID data and add statistical controls for period.* In Table 2, model A controls only for potentially confounding background factors (race, gender, age, grandmother's education and employment, number of maternal siblings and family structure). In model B, we add dummy variables for period and for the interaction between age of mother at first birth and period of first birth.†

The exact nature of the changes that have occurred in the effects of a teenage birth over time is difficult to determine from the regressions because of the complex interactions involved. The calculation of the predicted effect of a teenage birth in a particular period requires adding the coefficients of the appropriate period and interaction effects to the main effect of a teenage birth in the late 1960s (the comparison period). In Figures 1–5, we have graphed these predicted achievement and behavior-problem test scores for children born to women who first gave birth as teenagers and for children born to women who were older at first birth; the figures, which are based on PSID data, cover the period from the late 1960s through the early 1990s.‡

• *Achievement test scores.* When we control only for maternal background characteristics, children whose mothers had a first birth as a teenager have lower scores on all four achievement tests than do children of adult mothers (Table 2, model A). Once the second set of controls is introduced (model B), however, the differences decline on all of the tests except passage comprehension.

FIGURE 1. Predicted scores on letter-word identification test among children of women who first gave birth during their teens and children of women who first gave birth as adults, by period of first birth, PSID

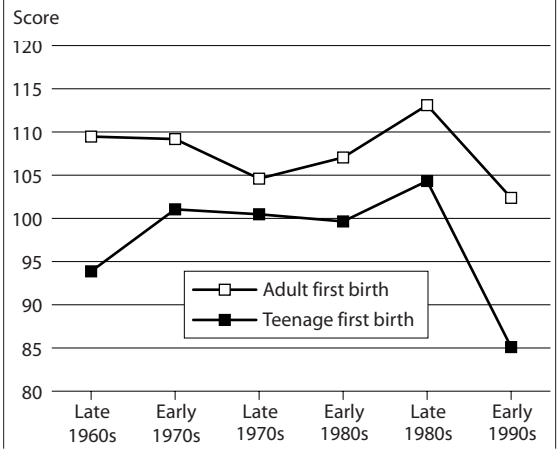


*A table providing the means on variables used in the regression analyses is available from the first author.

†The addition of the entire set of period dummies and interactions with age at first birth adds significantly to the explanatory power of the model for the letter-word identification, passage comprehension and behavior-problem measures. Since individual coefficients are significant in the other tests as well, we discuss all the outcome variables.

‡Predicted values were obtained from the regressions in Table 2 by substituting 1.0 for the appropriate age at first birth, period of first birth and age-period interaction, with the control variables set at their mean values.

FIGURE 2. Predicted scores on passage-comprehension test among children of women who first gave birth during their teens and children of women who first gave birth as adults, by period of first birth, PSID



On the letter-word identification test (Figure 1), the calculation test (Figure 3) and the applied-problems test (Figure 4, page 48), the scores of children of women who first gave birth as teenagers in the late 1960s are not significantly different from those of children born to women who delayed childbearing. However, children of late-1960s teenage mothers score significantly lower than children of older mothers on the passage-comprehension test (Figure 2); the difference in test scores is about 16 points.

As in the data from the National Assessment of Educational Progress, there is a time trend in test scores. Table 2 shows that on the letter-word and applied-problems tests, the scores for children of mothers with a first birth in the late 1980s are significantly higher than those of children whose mothers had a first birth in earlier periods; on the calculation test, there is a marginally significant increase. Figures 1 and 4 show that the scores of the children of both early and later childbearers have risen over time.

Our analysis provides little evidence that the effect of an early birth on children's achievement has changed over time. Only one interaction between period of first birth and teenage birth shows any link to achievement (Table 2). Compared with children whose mothers had a teenage birth in the late 1960s, children whose mothers had a teenage birth in the late 1980s have lower scores on the calculation test, but the difference is only marginally significant. As Figure 3 shows, the difference between the calculation test scores of children of teenage and nonteenage childbearers in the late 1980s is about 10 points, the largest difference between the two groups during the period studied. The scores of children of early and delayed childbearers appear to converge in the graphs for the letter-word, calculation and applied-problems tests, but this convergence may reflect differences in birth order and in the ages of children at assessment.

• *Behavior problems.* Levels of behavior problems are strongly related to the mother's age at first birth, with children of mothers who were teenagers at first birth scoring higher (i.e., worse) on measures of total and externalizing behavior problems (differences of 0.9 and 0.8 points in model A). All three measures show significant differences once the effects of time period and its interactions are accounted for (3–8 points). Figure 5 (page 48) indicates that, in contrast to the pattern for achievement test scores, the trend for behavior-problem scores for children of teenage mothers is curvilinear, with the lowest levels in the late 1970s. The figure also shows an eight-point gap between children of teenage and adult childbearers in the late 1960s. This large difference could reflect the inclusion of only the youngest children of teenage childbearers in the early periods. There is an interaction between having a mother with a teenage first birth and period of first birth in the effect of a teenage birth on behavior problems. Children whose mothers had a teenage first birth in the late 1970s have lower behavior-problem scores than do children of women who delayed childbearing, but children of recent early childbearers have higher scores than do children of older mothers. These effects are due primarily to differences in externalizing behavior problems.

Implications

From the analysis presented here, it is clear that the effect of a teenage birth depends on the years compared and on whether the level of the outcome involved is changing.

When achievement is improving, as in the letter-word test, the comparison of a birth to an adult woman in the early 1990s with a teenage birth in an earlier period exaggerates the effect of birth timing on test scores. Comparing the scores of children of mothers with an early 1980s teenage birth with the scores of children whose mothers were adults when they had their first birth in a later period would exaggerate the difference, since test scores have risen for both groups (Figure 1). When period changes are taken into account, the effect disappears.

If there is no trend in children's test scores, the effect of a teenage birth on achievement is not likely to be affected by period changes. There are no time trends in children's passage-comprehension scores between the early 1970s and

FIGURE 3. Predicted scores on calculation test among children of women who first gave birth during their teens and children of women who first gave birth as adults, by period of first birth, PSID

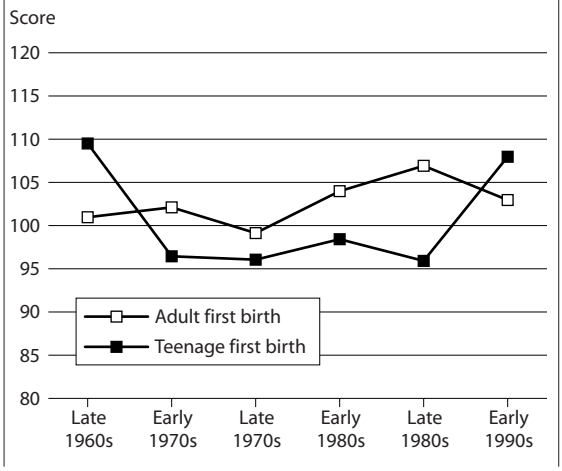
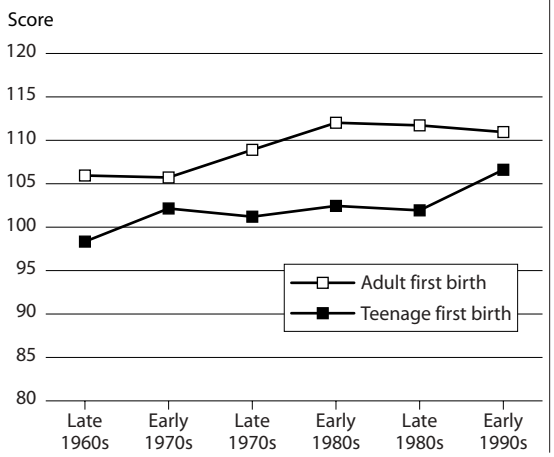


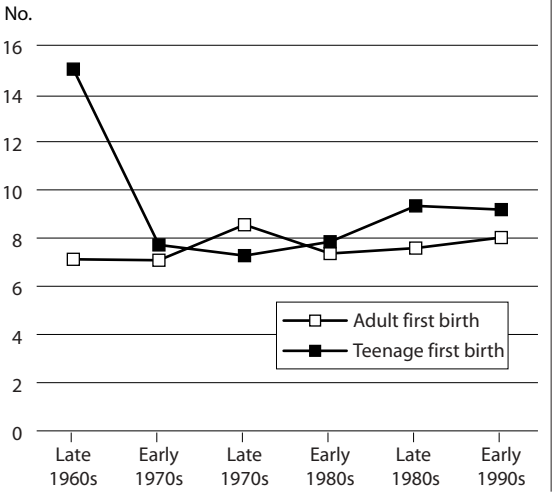
FIGURE 4. Predicted scores on applied-problems test among children of women who first gave birth during their teens and children of women who first gave birth as adults, by period of first birth, PSID



the late 1980s (Figure 2); therefore, period effects will not alter conclusions about the effects of early childbearing.

When behavior-problem scores rise, the effect of a teenage birth is masked. The difference in the total behavior-problem scores of children of teenage and adult childbearers was small in the early 1980s, but was greater in the early 1990s (Figure 5). This change was due primarily to worsening externalizing problems; scores for internalizing problems changed little. Comparing the behavior-problems score of a child of an adult mother in the early 1990s with that of a child of a teenage mother in the late 1970s or early 1980s would lead to mistaken conclusions about the impact of a teenage birth. This comparison would show little difference in behavior problems, whereas children of teenage mothers consistently have worse behavior-problem scores than children of adult mothers when viewed period by period across the 1980s and into the early 1990s. Thus, such an analysis would find no difference or would even find that children of teenage mothers had fewer behavior problems, because scores for children of teenage mothers were low in the late 1970s but rose gradually thereafter, whereas those for adult childbearers remained about the same over the entire period.

FIGURE 5. Predicted total number of behavior problems among children of women who first gave birth during their teens and children of women who first gave birth as adults, by period of first birth, PSID



SUMMARY AND CONCLUSIONS

When following the children of a cohort of mothers, researchers face an unsolvable dilemma—the time period of data collection is confounded with the mother's age at the child's birth. Moreover, because period of first birth is likely to be associated with both maternal age at first birth and at least some children's outcomes, the effect of age at first birth on children's development is biased.

The importance of including period variables is shown in the PSID analyses. First, test scores for all children and behavior-problem scores for children of teenage mothers have changed over time. Second, when we control for period, the effects of maternal age at first birth on achievement test scores may be stronger or weaker than (or the same as) findings from a model without such a control.

We found less support for our hypothesis that the effect of early childbearing on children's development varies over time. Our analysis did show period variations in the effect of early childbearing on behavior-problem scores, but yielded no significant variations for cognitive achievement.

We conclude that when behavior or achievement scores or the effects of age at first birth change over time, the effect of birth timing is confounded with period changes and is impossible to separate without independent variation in first-birth age within period. Clearly, such period effects are fairly common and substantial. Although few researchers have pooled NLSY data for children born from the 1970s through the 1990s, more will do so. Those who do should consider an alternative explanation for their findings or take time trends into account, particularly if the outcome could be affected by the age of the mother at first birth.

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