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The Consequences of Teenage Childbearing[1]

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Abstract

We examine the effect of teenage childbearing on the adult outcomes of a sample of women who gave birth, miscarried or had an abortion as teenagers. If miscarriages are (conditionally) random, then if all miscarriages occur before teenagers can obtain abortions, using the absence of a miscarriage as an instrument for a live birth provides a consistent estimate of the effect of teenage motherhood on women who give birth. If all abortions occur before any miscarriage can occur, OLS on the sample of women who either have a live birth or miscarry provides an unbiased estimate of this effect. Under reasonable assumptions, IV underestimates and OLS overestimates the effect of teenage motherhood on adult outcomes. For a variety of outcomes, the two estimates provide a narrow bound on the effect of teenage motherhood on adult outcomes and which is relatively modest. The bounds can also be combined to provide consistent estimates of the effects of teen motherhood. These effects are generally adverse but modest.

1 Introduction

Most policy-makers view teenage childbearing in the United States as an important issue. President Clinton called it "our most serious social problem" in his 1995 State of the Union address. Adult outcomes among women who gave birth as teenagers are in most respects much worse than those of women who delay childbearing. However, these differences may not reflect the causal effect of teenage childbearing on the mothers. Teenagers who engage in risky sexual behavior and do not turn to abortion if they become pregnant may be very different from those who either avoid pregnancy or have an abortion. In particular, girls who do not expect to finish high school, get married or find a good job, may be more likely to become teenage mothers. In fact, social scientists have failed to establish convincing evidence of a causal link between teenage childbearing and the mother's educational, labor market, and marital outcomes.

The most careful attempts to isolate a causal effect have found at most modest positive effects of delaying childbirth and in some cases find negative effects. Geronimus and Korenman (1992) compare outcomes for sisters and find little difference in outcomes between the sister who gave birth as a teenager and the sister who did not. Ribar (1994) uses age at menarche as an exogenous source of variation in age at first birth and finds no causal link between teenage childbearing and high school completion. Hotz, McElroy, and Sanders (1998) use miscarriage as an instrument for birth among girls who become pregnant as teens.[1] They find that delaying childbearing *reduces* the probability that girls complete high school and *adversely* affects a number of other adult outcomes. Both Ribar and HMS capture the effect of teen childbearing on those who would choose not to have an abortion. Therefore they should obtain similar results. The difference between the Ribar and HMS results may reflect the fact that the different choice of instruments captures the effects of childbirth at different ages[2] or, as we will discuss shortly, bias in the HMS estimator.

We note in passing that identification in Levitt and Donohue (2001) is quite different. They exploit state-time variation in the legalization of abor-

[1] See also Hotz et al (1997).

[2] While both estimates measure the effect of motherhood on women who would bring a child to term, Ribar (1994) implicitly focuses on much younger women than HMS (1997) as most of the variation in age at menarche occurs between the ages of 12 and 14 compared to a median age of 16 in the HMS sample.

tion and thus estimate the causal effect of abortion access on the children of women who want to have an abortion. Women who would choose to delay childbearing by having an abortion should have more to gain by doing so than those who do not. This is consistent with more negative effects of childbearing in Levitt and Donohue than in Ribar or HMS. Unfortunately there is no way to compare the estimated parameters across instrumental variables strategies directly because there are no common outcomes of interest among them. Levitt and Donahue focus on criminal activity of the woman's children while Ribar and HMS focus on labor market and educational outcomes of the woman.

The HMS results tell a story of the effect of teenage motherhood that is very different from the one implicit in President Clinton's characterization of the issue. They find that teenage motherhood has only a small effect on completed fertility. Most of the effect is on the timing of births. The literature suggests that the presence of young children reduces female labor supply.[3] Therefore we should not be surprised that, as HMS find, delaying childbirth initially raises labor supply but later decreases it. In a Ben-Porath style human capital investment model, early childbirth can be a wealth-maximizing strategy (Buckles, 2005).

But is teenage childbirth really as benign as the HMS results suggest? We argue that miscarriage is not a valid instrument for birth and that the estimates in HMS are biased in the direction of finding beneficial effects of teenage childbearing. The essence of the argument is as follows. We accept (and provide evidence in support of) the view expressed in HMS that, from a medical perspective, miscarriages are random (at least given a few behavioral factors such as smoking, drinking, and contraceptive behavior). In the absence of abortion, miscarriage would therefore be a valid instrument for (the absence of) birth.

However, when abortion is an option, teenagers who miscarry are less likely to be girls who would otherwise abort their pregnancy than are teenagers who either abort or carry the child to term. Since, as we will see, teenagers who have abortions, on average, come from more favored backgrounds than those who do not, girls who miscarry are not a random sample of pregnant

[3]Angrist and Evans (1998) use the randomness of sex mix of the first two children as an instrument for having a third child and find that motherhood has small but notable effect on female labor supply. Similarly, Bronars and Grogger (1994) use the randomness of twins at first birth as a natural experiment and conclude there are small, albeit short-lived, effects on the labor supply of unwed mothers.

teenagers but are, instead, drawn from more disadvantaged backgrounds. The IV estimator therefore underestimates the true costs of teenage childbearing. The HMS estimates are biased towards a benign view of teenage childbearing.

Our message, however, is not entirely negative. We propose an alternative estimator that is biased against the benign view. We present OLS estimates of the effect of teenage childbearing using a sample of women who either gave birth or miscarried as teenagers. Some women who would otherwise have had an abortion, miscarry before the abortion can take place, but, of course, by definition women who give birth would not have had an abortion. The sample of women who miscarried is therefore more favorably selected than the sample of women who gave birth, and thus our estimates are biased towards finding adverse effects of teenage childbearing.

We compare our OLS estimates from the miscarriage/live-birth sample with HMS-style IV estimates. In most cases, the IV estimates suggest a positive effect of teenage childbearing while the OLS estimates suggest a negative effect. However, the bounds are relatively tight. For example, the IV estimate is that teenage motherhood raises high school graduation by six percentage points among women who give birth as teens. In contrast, the OLS estimate is that teen childbearing reduces this rate by five percentage points. When we take into account later teen births among those who abort or miscarry, the range expands somewhat. The HMS IV approach gives a positive nine percentage point effect on a diploma while the OLS estimate on the restricted sample produces an estimate of a seven percentage point reduction. This lower-bound estimate, while not trivial, does not suggest that delaying childbirth would dramatically improve outcomes for the types of girls who give birth as teens.

Under the assumption that, given that a teenager has an abortion, its timing is independent of her adult outcomes, we can use the bounds from our two estimates and some auxiliary information to obtain a consistent estimate of the effect of teen motherhood on those teenagers who would choose to give birth. In particular, we define women who would miscarry in the absence of abortions as miscarriage types and women who would have an abortion in the absence of miscarriages as abortion types. We require an estimate of the fraction of women who are both miscarriage and abortion types who end up having an abortion. We use a simple competing risks framework to estimate this fraction.

In most dimensions our results suggest a modest adverse effect on adult outcomes from giving birth as a result of a first teen pregnancy. The probability of getting a high school diploma is unaffected but the probability of getting a GED is reduced by about five percentage points and average education is lower by about .15 years. The probability of working is reduced by about five percentage points and weekly hours by about four, but the effect on income conditional on working is close to zero. Women who give birth as teens are about three percentage points less likely to be currently married, but conditional on being married have husbands who earn more than the husbands of women who do not give birth as teens. Overall, there is almost no effect on family income but since women who give birth as teens have larger families, their income relative to an index of family needs is a marginally lower. Few of these differences approach statistical significance. The one exception is number of children, where we find that having a child as a teenager increases the expected number of live births by about eight-tenths.

One reason that births may not have a large effect on adult outcomes is that many teens who have an abortion or miscarry on their first pregnancy subsequently nevertheless give birth as teens. When we use miscarriage on first pregnancy as an instrument for any teen birth, the results do not change substantially although the bounds become wider, and our consistent estimates of the effects tend to be slightly more negative.

The next section gives a mostly intuitive explanation of the statistical issues. Section three describes the data we use. In contrast with the earlier literature, we use the 1995 National Survey of Family Growth which is better suited than the NLSY for measuring pregnancy outcomes. In section four we present evidence in support of the argument that miscarriages are conditionally random. The fifth section presents the results using the upward and downward-biased estimators while the consistent estimates are discussed in the sixth. Sections seven and eight extend our approach to account for births from a second pregnancy and present the results of that extension. Section nine addresses a number of potential problems with our estimation. Section ten concludes.

2 Methods

We will restrict our analysis to women who became pregnant as teenagers. We are interested in the difference in outcomes between women who became pregnant as teenagers and gave birth and those who did not. We will not address the effect of pregnancy, itself, on adult outcomes. We will also initially ignore the problem of multiple teen pregnancies but will return to this topic after laying out the groundwork.

Let Y^1 be some outcome of interest (e.g. educational attainment) for a particular woman if she gives birth, and let Y^0 be the outcome for the same women if she does not give birth. Note that this implies that miscarriages and abortions affect potential outcomes in the same way and that the important difference is between births and non-births.

HMS make a convincing case that miscarriages are random with respect to most factors that are likely to affect adult outcomes, especially if one controls for alcohol use, smoking and form of contraception.[4] For the moment, we maintain the assumption that miscarriage is conditionally random. We return to this issue below.

If so, in the absence of abortions, measuring the effect of a live birth on women who became pregnant as teenagers would be straightforward. We would simply compare outcomes for those who gave birth with those who miscarried.[5] More formally, let B_i be an indicator variable for the pregnancy ending in birth. Then, in the absence of abortions, the mean outcome for those giving birth ($\Sigma_{B_i=1} Y_i/N_1$) is a consistent estimate of $E(Y^1|B=1)$ and similarly for the mean outcome for those not giving birth and the difference between the two means is a consistent estimator of the effect of giving birth on teenagers who become pregnant.

When pregnancies can end in any of three ways, a live birth, abortion, or miscarriage, the situation is more complicated. In the absence of miscarriages, some teenagers would carry the pregnancy to term and others would have an abortion, We represent this miscarriage-free outcome by B_i^* which equals one for live birth and zero for abortion and will use the terminology latent-birth type for $B^* = 1$ and latent-abortion type for $B^* = 0$ or just birth or abortion-type when dropping the modifier "latent" is unlikely to be confusing.

We cannot hope to identify the effect of giving birth on women who would choose abortions. Since they either miscarry or have an abortion, we never

[4]A related paper, Hotz et al (1997) allows for a proportion of miscarriages to be non-random and estimates bounds on the effects of teen motherhood and reaches broadly the same conclusions as HMS.

[5]We ignore for the moment the problem of multiple pregnancies. In fact, as can be seen in Table III, teenagers may have multiple pregnancies. Initially, we examine only the first pregnancy. We address multiple pregnancies in the extensions section.

observe them having a child. However, since some women who would choose a live birth do not give birth because they miscarry, there is some prospect that we could identify the average effect of having a child on women who would choose to have a child ($E[Y^1 - Y^0|B^* = 1]$). $E(Y^1)$ is readily obtained as the mean outcome for women who gave birth as teenagers. $E(Y^0)$ poses a greater challenge because the women who would choose to give birth but do not are not directly identifiable from the data.

The statistical problem arises because we do not expect B^* to be independent of the potential outcomes Y^1 and Y^0. Instead, economic theory strongly suggests that teenagers for whom the cost of giving birth ($Y^0 - Y^1$) is relatively large will be more likely to choose abortions ($B^* = 0$). We strongly suspect that this difference tends to be larger for teenagers whose prospects are more favorable ($E(Y^0|B^* = 0) > E(Y^0|B^* = 1)$). For notational simplicity, we will use Y_B to refer to $E(Y^1|B^* = 1)$ the expected outcome from a birth among women who would choose to give birth, Y_0 to refer to $E(Y^0|B^* = 1)$, the expected outcome in the absence of a birth among women who would choose to give birth and Y_A to refer to $E(Y^0|B^* = 0)$, the expected outcome in the absence of a birth among women who would choose an abortion.

2.1 Special Cases

Before addressing the general identification problem, let us consider two cases where estimation is straightforward. Assume first that all miscarriages happen early in pregnancy and therefore before any teenager is able to arrange for an abortion. This means that miscarriage is independent of whether a teenager is a latent-birth or latent-abortion type and, given the assumption that miscarriage is random, therefore a valid instrument for birth. Somewhat more formally, let b be the fraction of latent-birth types in the population and denote a miscarriage by M equals 1. Then

$$E(Y|M = 0) = bY_B + (1-b)Y_A \quad (1)$$

$$E(Y|M = 1) = bY_0 + (1-b)Y_A \quad (2)$$

so that

$$E(Y|M = 0) - E(Y|M = 1) = bY_B - bY_0 \quad (3)$$

or

$$Y_B - Y_0 = \frac{E(Y|M = 0) - E(Y|M = 1)}{b}. \quad (4)$$

Note that in this case, we can estimate b by the difference between the birth rate among those not miscarrying and those miscarrying (which is, of course, zero). Substituting for b in (4) gives the Wald estimator and shows that the HMS IV estimator provides a consistent estimate of the treatment effect.

Now assume the opposite: all miscarriages occur late in pregnancy so that all latent abortions are realized. Then teenagers who miscarry are a random sample of latent-birth types, and OLS on the sample of women who either miscarried or gave birth as teenagers is a consistent estimator.

2.2 Finding Bounds

Unfortunately, neither of these two cases is accurate. Miscarriages occur both early and late in pregnancy. Some miscarriages prevent abortions that would otherwise have taken place but there are also miscarriages that would have happened had the teenager not had an abortion. Let us examine the two estimators in this case.

Consider first the IV estimator. The teenagers who miscarry are not a random sample of the (pregnant) population. They are disproportionately women who would not have an abortion. Put differently, among women who miscarry, latent-birth types are over-represented relative to their fraction in the population. This, in turn, means that among women who do not miscarry, latent-abortion types are over-represented. Since latent-abortion types come from more favored backgrounds than latent-birth types, the IV estimator will underestimate any adverse impact of teenage childbearing.

Again, somewhat more formally, let $M^* = 1$ represent a teenager who would miscarry in the absence of abortion and m be the fraction of teenagers who would miscarry. Further assume that if the woman is both a latent-miscarriage and a latent-abortion type ($M^*(1 - B^*) = 1$), then she has an abortion with probability γ and a miscarriage with probability $1 - \gamma$.

Then the expected outcome given a miscarriage is

$$E(Y|M = 1) = \frac{(1 - b)(1 - \gamma)Y_A + bY_0}{1 - \gamma + b\gamma} \tag{5}$$

while the expected outcome given no miscarriage is

$$E(Y|M = 0) = \frac{(1 - b)(1 - m + m\gamma)Y_A + b(1 - m)Y_B}{1 - m + m\gamma - bm\gamma} \tag{6}$$

The Wald estimate of the effect of a birth on the outcome is given by

$$\beta_{IV} = \frac{E(Y|M=0) - E(Y|M=1)}{E(B|M=0) - E(B|M=1)} = \frac{E(Y|M=0) - E(Y|M=1)}{E(B|M=0)}. \quad (7)$$

Substituting for (5) and (6) in (7) and using the fact that

$$E(B|M=0) = \frac{b(1-m)}{1-m+m\gamma-bm\gamma} \quad (8)$$

yields that the IV estimate of the effect of teenage childbearing is given by

$$p\lim(\beta_{IV}) = Y_B - Y_0 + \frac{(Y_A - Y_0)\,\gamma(1-b)}{(1-m)\,(1-\gamma+\gamma b)}. \quad (9)$$

If expected outcomes in the absence of a birth are more favorable for latent-abortion than latent-birth types, then IV will be a biased estimator of $Y_B - Y_0$ unless either γ equals zero (all miscarriages precede all abortions) or b equals one (there are no abortions).

What about OLS on the set of women who gave birth or miscarried as teenagers? Needless to say, the group of women who gave birth consists only of latent-birth types. On the other hand, those who miscarried are a mixture of latent-birth and latent-abortion types and therefore drawn from a more favored population. OLS on this sample will therefore over-estimate the adverse effect of teenage childbearing. It is straightforward to show that

$$p\lim(\beta_{ols}) = Y_B - Y_0 - \frac{(Y_A - Y_0)(1-\gamma)(1-b)}{(1-\gamma+\gamma b)}. \quad (10)$$

OLS will be downward-biased (exaggerate the negative impact of a teen birth) unless all abortions come before all miscarriages ($\gamma = 1$) or there are no abortions ($b = 1$).

2.3 Consistent Estimation

The calculations of the bias assume that the expected outcome among latent-abortion types is independent of whether they have the abortion early or late. One can imagine that more advantaged teenagers would get abortions earlier in their pregnancy because they are more likely to have the resources to obtain an abortion quickly. One can equally imagine that since late abortions are more complicated and expensive, they would be more likely to be available to more advantaged teenagers. The issue is unimportant for determining the direction of the bias for the two estimators provided that latent-abortion types are more advantaged teenagers regardless of whether they have early or late abortions, but is important for our attempts to get consistent estimates of the effects. We examine evidence on this issue below.

For the moment we assume that Y_A is independent of the timing of the abortion. Then the treatment effect is given by

$$Y_B - Y_0 = \frac{\beta_{ols}\gamma + (1-\gamma-m+m\gamma)\beta_{IV}}{1-m+m\gamma}. \tag{11}$$

In line with our previous reasoning, when γ equals 1, all abortions preceed all miscarriages, and the consistent estimator reduces to OLS. When γ equals 0, all miscarriages preceed all abortions, and the consistent estimator reduces to the HMS instrumental variables estimator.

In all other cases, to obtain a consistent estimate of the treatment effect, we require consistent estimates of the fraction of pregnant teenagers who are latent-birth types (b), the fraction of pregnant teenagers who are latent-miscarriage types (m) and the fraction of those who are both latent-abortion and latent-miscarriage who have abortions (γ).

We use a competing risks model to identify these parameters. Our data are weekly so that there is a nontrivial possibility that a miscarriage and abortion would both be "scheduled" for the same week. We present our calculation for the case where in this event we observe a miscarriage which we refer to as "miscarriage first." The case where we observe an abortion (abortion first) is analogous. We use both approaches in the empirical work.

The probability of a miscarriage in the first week is just

$$P(M_1) = m_1$$

while the probability of an abortion is

$$P(A_1) = a_1(1-m_1).$$

More generally the probabilities of miscarriage and abortion in week t are given by

$$\begin{aligned} P(M_t) &= m_t(1-\Sigma_{i=1}^{t-1}a_i) \\ P(A_t) &= a_t(1-\Sigma_{i=1}^{t}m_i). \end{aligned}$$

Note that the fractions of latent-miscarriage and latent-abortion types are given by

$$m = \Sigma m_t \tag{12}$$

$$(1-b) = \Sigma a_t. \tag{13}$$

Inserting these estimates into equations (9) and (10) provides consistent estimates of $Y_B - Y_0$ and of $Y_A - Y_0$. These consistent estimates are based on the assumption that when an abortion and miscarriage are "scheduled" for the same week, we observe a miscarriage. The estimates of m, b and γ are slightly different if we assume instead that we observe an abortion when both are scheduled for the same week. Fortunately, as we will see, the results are not sensitive to this assumption.

3 Data

The data employed in this analysis are from the 1995 wave of the National Survey of Family Growth, a survey administered by the National Center for Health Statistics (NCHS), an agency of the Department of Health and Human Services. The purpose of the survey is to produce national estimates and information on factors affecting pregnancy, including sexual activity, contraceptive use, infertility, and sources of family planning services, and on the health of women and infants.

A national probability sample of 10,847 civilian non-institutionalized women ages 15 to 44 was interviewed between mid-January and October 1995. The interviews were conducted in person by trained female interviewers using laptop or notebook computers. The interview, which lasted an average of 105 minutes, collected data on each pregnancy; contraceptive use by the interviewee and her partner; her ability to bear children; the use of medical services for contraception; infertility and prenatal care; her marriage, cohabitation, living situation, and work history; and a variety of demographic and economic characteristics. Additional data were collected in a short self-administered interview in which the respondent heard questions over headphones and entered her own answers into the notebook computer. This approach is designed to reduce the underreporting of abortions which is a serious problem that must be acknowledged in any study using fertility microdata. While between 54 and 62 percent of abortions that actually occurred were probably reported in the NSFG, it is unlikely that the more commonly used NLSY does anywhere near that well.[6]

We focus on twelve outcome variables. The first three are measures of education: whether the individual has a high school diploma, has a GED and years of educational attainment. The next two concern marital status: whether the woman is currently married and whether she is currently divorced or separated. We also examine spouse's earnings conditional on the woman being married or living with a partner. We examine whether the woman is working, and conditional on working how many hours she works per week and what she earns annually. In addition, we look at total family income and income relative to the poverty line given family composition. The data set contains imputed family income for those who do not answer the question. Our early experiments showed little difference between the results with and without the imputed data. There are well known advantages and disadvantages to relying on imputed data. We compromise by using only actual data when examining family income and including the imputed data when reporting income relative to the poverty line. Unfortunately, income data are reported only in intervals. We impute income using these intervals.[7] Finally, we examine the number of live births.

Table I presents weighted means and standard deviations for key variables. The information is presented for the all women who were at least 20 years old at the time of the survey and for the teen pregnancy sub-sample, which consists of women who had their first pregnancy before their 18th birthday. This is conceptually the same sample HMS extract from the National Longitudinal Survey of Youth (NLSY) in their analysis, and will be the basis for much of our empirical work below. Note that not all of the women in the teen pregnancy sample were teen mothers. On average, they first gave birth at eighteen, approximately four and half years earlier than the average for the full sample.

[6] These statistics are computed by comparing the total number of abortions implied by NSFG data with institutional sources, and are reported in user documentation.

[7] There are eighteen intervals which we impute as follows: less than $7,000 ($3500), $7,000-$8,499 ($7,750), $8,500-$9,999 ($9,250), $10,000-$11,999 ($10,999), $12,000-$13,999 ($12,999), $14,000-$15,999 ($14,999), $16,000-$17,999 ($16,999), $18,000-$19,999 ($18,999), $20,000-$24,999 ($22,499), $25,000-$29,999 ($27,499), $30,000-$39,999 ($34,499), $40,000-$49,999 ($44,499), $50,000-$59,999 ($54,499), $60,000-$69,999 ($64,499), $70,000-$79,999 ($74,499), $80,000-$89,999 ($84,499), $90,000-$99,999 ($94,499), $100,000 and up ($124,499).

The top panel of Table I illustrates the well-known differences in outcomes for women who were teen mothers and women as a whole. Relative to the full sample, women in the teen pregnancy sample are more likely to be divorced and less likely to be currently married and have lower spousal income conditional on being married or with a long-term partner, are less likely to be working and work fewer hours and have lower personal income conditional on working, have lower family income, are less likely to have obtained a high school diploma, a difference that is not fully offset by their greater tendency to have a GED.

The lower panel of Table I reveals that there are also significant differences in family background between the women who became pregnant as teens and the sample as a whole. The teen pregnancy sample contains a higher proportion of blacks and a somewhat higher proportion of Hispanics than the full sample. It is somewhat more Protestant and less Catholic than the full sample. Women in the teen pregnancy sample are much more likely to have had an absent father and/or mother and had less educated parents on average.[8] Their mothers were more likely to have worked.

Since women who become pregnant as teens are not a representative sample of the teen population, differences in adult outcomes between those who become pregnant as teens and those who do not should not be ascribed to their pregnancy. More significantly, we are measuring the effect of teen childbearing on a select group, not on a random teen, and, as we emphasized in the previous section, within this select group on those who would not choose to have an abortion.

Table II provides important sample statistics for the Teen Pregnancy Sample. Each of the variables is constructed in a straightforward manner except for the smoking dummy variable. In the survey, women are asked if they have smoked more than 100 cigarettes in their life, and if so when they started smoking. A smoker is defined as a woman who started smoking before the age at which the pregnancy started. There is more detailed data on smoking during pregnancy, but these questions were not asked of women who end the pregnancy with an abortion. Therefore, we use the "smoked before pregnancy" variable which is similar to that employed by HMS. While over 60 percent of girls had smoked 100 cigarettes in their lifetime, only 28 percent

[8]The no mother and no father variables are drawn from responses to parental education questions that are coded no mother (father) figure.

started smoking before the pregnancy, a risk factor for miscarriage.[9]

In addition to smoking, using certain drugs (notably cocaine and heroine, possibly caffeine, but probably not marijuana), using an IUD before pregnancy (in some studies) and being less than fifteen years old at conception are believed to be risk factors for miscarriage. Unfortunately, the NSFG does not include data on drinking behavior before pregnancy. The NSFG does include information on use of an IUD before pregnancy but only three members of our teen pregnancy had used an IUD before their pregnancy and none of these reported miscarrying. Table II reveals that almost 85 percent of pregnancies occur after a girl's 15th birthday, the cutoff for the first risk factor of assigned miscarriage.

Miscarriage occurred in about 9 percent of first teen pregnancies, abortion in 25 percent, and birth in 65 percent. Table III gives average outcomes separately for teen mothers, those who had abortions and those who miscarried. Outcomes are generally similar for women who gave birth or miscarried. Those who miscarried have a slightly higher probability of having a high school diploma or GED and marginally higher personal and family incomes. They are also marginally more likely to be currently working, married and work somewhat more hours per week. They had their first child three years later than those who gave birth but actually have their next pregnancy somewhat earlier.

The group that stands out as distinct in Table III is the set of women who terminated their first pregnancy by having an abortion. This group is much more likely than the others to have obtained a high school diploma, has substantially higher personal and family income, is somewhat more likely to be working and works more hours. Both their next pregnancy and their first birth occurred later than for the other two groups. The figures in Table III

[9] Our summary of the literature relies primarily on Regan and Rai (2000) and Garcia-Enguidanos et al (2002) but also on Porter and Hook, 1980 and Kline, Stein and Susser (1989) and conversations with phyicians. The consensus is that about 75% of conceptions do not result in a live birth and that the vast majority of these concpetions are never recognized. About 12-15% of miscarriages are clinically recognized. The risk factors for miscarriage are not well-established, in part because there are few prospective studies, and because some of the recognized risk factors are highly collinear. For example, almost all cocaine users smoke, recognized as a risk factor, but studies of the effect of cocaine have generally not controlled for smoking. Similarly, among adult women age does appear to be a risk factor but its importance may be exaggerated by women who have had miscarriages being more likely to continue to conceive later in life. The summary in this section is, of necessity, subject to these limitations.

highlight the importance of how abortions are treated in the analysis because of the much more favorable outcomes for this group.

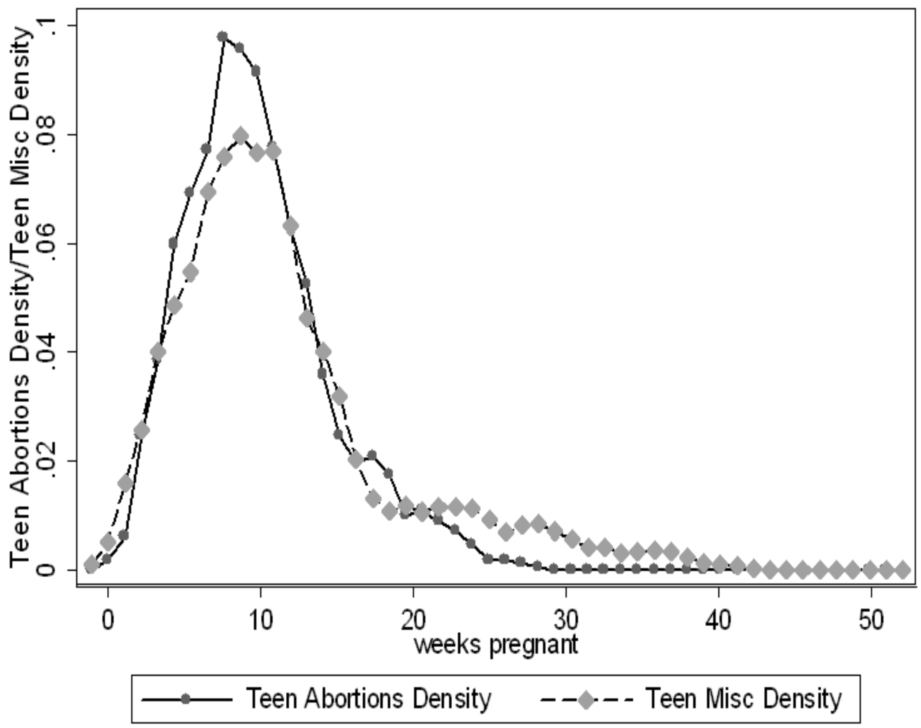
The lower part of Table III shows that there are also big differences in the family backgrounds of teens associated with the outcomes of their pregnancies. In particular, teens whose pregnancy ends in abortion are more likely to be white and have more educated parents and are less likely to have grown up without a mother or a father. Consistent with our argument that some of the women who miscarry would otherwise have had abortions, the women who miscarry are somewhat more advantaged than those who give birth but less advantaged than those who have abortions. In particular, they are more likely to be white than those who give birth but less likely than those who have abortions. Their parents' education levels fall between those of the other two groups. The only exception is that women who miscarry are more likely to have grown up without their mother than are either of the other two groups.

Figure 1 shows the timing of abortions and miscarriages. We can see that neither occurs earlier in the sense of stochastic dominance. The distribution of miscarriages is more dispersed than that of abortions. Very early miscarriages are more common than very early abortions while very late miscarriages, including stillbirths, are also more common than very late abortions. Therefore, it is not possible that all women who miscarry do so before they would choose to have an abortion or vice versa. On the other hand, overall abortions tend to be somewhat earlier than miscarriages which suggests that the implicit assumption in HMS that miscarriages precede abortions is problematic.

We have shown that if early and late abortions are drawn from the same pool, then we can obtain consistent estimates of the effect of teen motherhood on women who would not have an abortion as a teen. The two right-hand columns of Table III present some evidence on this.

Outcomes appear to be somewhat more favorable for women who had early abortions than for women who had late abortions as teens, but most of the differences are statistically insignificant. In fact, the only difference in outcomes that achieves significance at the .05 level is that those who had late abortions are less likely to be divorced or separated. There is also some evidence that they are less likely to have a high school diploma and more likely to have a GED. On the other hand, their average education level is higher. Given that we are looking at twelve different outcomes, we find Table III reasonably supportive of the assumption that outcomes for women who

Figure 1: Density Functions: Abortions and Miscarriages



have early and late abortions are similar.

There are also statistically significant differences in background characteristics. Most notably, those having late abortions are less likely to be Catholic and more likely to have a working mother.

4 Are Miscarriages Random?

Our approach assumes that, in the absence of abortions, miscarriages would be random. In particular, we must assume that they are not correlated with other factors that predict adult outcomes. Below we present some direct evidence on this question, but we begin by pointing out that the difference in outcomes between early and late abortions already provides some indirect evidence.

Early abortions contain a higher fraction of teens who are also miscarriage types than do late abortions. If conditional on being an abortion type, miscarriage types are selectively drawn from teens with worse expected outcomes, then we would expect that early abortions would be associated with worse outcomes than are late abortions. We have seen that, if anything, they are associated with somewhat better outcomes. Of course, it is possible that late abortions are more adversely selected than early abortions and that this outweighs the negative effect of including miscarriage types among the early abortions. But Occam's razor pushes us to the simpler explanation that there are no large differences in outcomes between early and late abortions and between latent-miscarriage and latent-nonmiscarriage types. We must also recognize that there could be a difference between latent-birth types who do and do not miscarry although Occam's razor also rules against this argument. Still, we turn now to direct evidence.

The teen pregnancy sample is too small to allow us to examine directly the relation between individual characteristics and miscarriage. Therefore, we use the entire pregnancy sample, not just the sample of women who first became pregnant as teens.

Table IV presents a serious of probit estimates of the relation between individual characteristics and miscarriage. The first column looks at this relation for the entire sample and thus represents the effect on the probability of miscarrying versus either giving birth or having an abortion. The second column repeats the exercise but excludes those who terminated their first pregnancy through an abortion.

It is evident that a number of factors predict miscarriage. As already noted, smokers are more likely to miscarry. There is also some evidence that girls who conceive before age fifteen and women who used an IUD before pregnancy are more likely to miscarry although the former is only significant when we exclude women who had abortions while in neither case is the effect of using an IUD statistically significant. More strikingly, there are large effects of not having a mother and not having a father (although these coefficients must be interpreted with caution since parental education is zero when there is no parent, and mothers are recorded as not working if they are absent). Somewhat surprisingly, having more educated parents is associated with a greater likelihood of miscarriage although these effects are statistically significant only when abortions are excluded from the sample.

However, as we have already stressed, the relation between miscarriage and personal characteristics may not reflect a direct or indirect medical relation between miscarriage and these characteristics. Instead, they may reflect the relation between those characteristics and abortion. Any factor that makes a woman more likely to have an abortion also makes her less likely to have a miscarriage.

Therefore in the third column we restrict ourselves to a sample for whom abortion is not a consideration, women who have been pregnant for at least twenty-four weeks. There are only four abortions recorded after the twenty-fourth week of pregnancy in our data. Such abortions are sufficiently rare that we expect that they are either errors or cases where the mother's life was in danger or the fetus was not viable. These four cases are excluded from the sample in column three.

Strikingly the equation has no explanatory power for miscarriages in the last trimester of pregnancy. None of the personal characteristics is individually statistically significant and the estimated magnitudes are generally small. The likelihood ratio χ^2 for the equation is 13.0, well short of statistical significance. The evidence in the third column suggests that miscarriages are random.

One concern is that third trimester miscarriages are sufficiently rare that our approach may be inadequate to find factors that predict them. Column four extends the sample to women who carried the fetus for at least sixteen weeks and did not subsequently have an abortion. Only about 1.5% of women who are pregnant after sixteen weeks have an abortion, so the risk of bias from selection remains modest. Sixteen weeks is also the latest period for which we can obtain meaningful estimates for the teen sample.

The results here are consistent with our expectations from reading the literature. Girls who conceive while less than fifteen are more likely to miscarry. Smoking is also a risk factor. Women who used an IUD before pregnancy are also more likely to miscarry. This effect is large although significant only at the .1 level. The remaining characteristics are insignificant individually and jointly.

Finally, in column five, we replicate column four for our teen pregnancy sample except that we drop IUD use since it is too rare in this sample. The results are similar to those obtained for the full sample except that there is no evidence that smoking promotes miscarriages among our teen pregnancy sample. Although, the t-statistic indicates that the effect of conceiving prior to age fifteen is statistically significant, we cannot reject the hypothesis that all the coefficients in column five are jointly insignificant. Moreover, we cannot reject the hypothesis that the coefficients in columns four and five are identical.

The results in Table IV provide strong evidence that, with the possible exception of the effects of smoking, IUD use and age at conception, miscarriages after the first four months of pregnancy (when most abortions have already taken place) are random. This, of course, does not demonstrate that, in the absence of abortions, earlier miscarriages would be uncorrelated with factors that influence adult outcomes. However, the evidence that outcomes for those having late abortions are no better than for those having ealry abortions runs counter to the argument that early miscarriages are adversely selected. The evidence is therefore consistent with the argument in HMS that miscarriages are largely random events.[10]

In what follows, we will present estimates in which we assume that miscarriages are random and also estimates in which we assume that miscarriages are random conditional on smoking behavior and age at conception. As a further check on our results, we will also experiment with limiting our OLS (birth vs. miscarriage) results to late miscarriages.

We do not, however, present results in which we control for other known correlates of outcomes such as race and parental education. Since these factors also predict abortion, it is easy to develop examples in which including

[10] The literature also suggests that father's age may be a risk factor for miscarriage. A nontrivial proportion of teen mothers do not report father's age. Our estimates did not reveal an effect on father's age on miscarriage but this may reflect both reduced sample size and selectivity of who does not report father's age.

them as controls worsens the bias or changes the sign of the bias.[11] Therefore, estimates with additional controls do not necessarily even provide bounds. We have, however, experimented with such controls, and the results do not change in any substantive way. In general, when we add additional controls our estimates suggest that the effects of teen births are even less adverse than we estimate with no controls or controls for known risk factors.

5 IV and OLS Estimates

Table V presents our initial estimates of the effects of teen motherhood on twelve adult outcomes for the women in our sample. The results are divided into two panels. The first panel makes no use of controls and thus provides the Wald estimates which, in the absence of weighting, could be gleaned directly from Table III. The second adds controls for smoking prior to conception and conception prior to age fifteen.

Within each panel, the first column shows the results from replicating the instrumental variables procedure in HMS using our data. In comparing our results with those in HMS, it is important to keep in mind that the women in our sample are, on average, thirty-two years old and thus younger than the women in HMS. HMS generally find that the positive effects of teen motherhood increase with age (an issue we discuss in the extensions section). The second column in each panel shows the results of restricting the sample to women who either gave birth or miscarried and estimating the equation by OLS.

The results using the IV approach are generally consistent with those obtained in HMS. With the exception of number of births and a shift from GED to an actual high school diploma, none of the effects of teenage motherhood is statistically significant at the .05 level. We find that being a teen mother increases total number of live births by about seven-tenths. Since many of the women in our sample have not yet completed their childbearing, it is likely that the difference in completed fertility will be smaller and thus comparable to the three-tenths difference found in HMS. We provide support

[11] The simplest case is when there are two groups of abortion types, some with outcomes that are better than those of the birth types in the absence of a birth and some whose outcomes are worse. In this case, if we can only predict one abortion type, the IV estimator will be either more biased or biased in the opposite direction depending on which type of abortion we can predict.

for this expectation in the extensions section.

We also find that, conditional on having a spouse or cohabiting partner, spousal earnings are over \$5,000 higher for women who were teen mothers, and this difference is significant at the .1 level both with and without risk controls. Family income is close to \$3,000 higher and almost one-eighth higher gauged relative to the poverty threshold. Although the differences fall short of significance at conventional levels, their magnitude is nontrivial. The estimated family income differential is about 10% of average family income for this sample.

We also find statistically insignificant but positive effects of teen motherhood on education as measured by either highest grade completed or having a high school diploma although this is offset by a reduction in the probability of having a GED. Having been a teen mother has an insignificantly negative effect on being married, working and hours worked conditional on working.

Thus as in HMS, our estimates suggest a benign view of teen motherhood. If anything, we should conclude that motherhood has positive effects on women who would choose to give birth.

However, as we have argued, the estimates in the first column of each panel in Table V are biased towards a benign view of teen motherhood. The second column, which shows the results of comparing women who miscarried with those who gave birth, presents a noticeable contrast.

Using the OLS approach in the second column, we find a somewhat larger difference in total fertility than using the HMS IV approach. More importantly, instead of finding an insignificant positive effect on education, we find a negative effect that in one cases reaches significance at the .05 level. Giving birth as a teen lowers the probability of obtaining a high school diploma by four or five percentage points, and the probability of having a diploma or GED by about eight percentage points (statistically significant at the .05 level) and lowers educational attainment by about one-third year.

In contrast with the positive effects on income reported in the first column, we find negative, albeit insignificant effects on own and family income. Teen motherhood reduces adult family income relative to the poverty line by 23%, although this estimate only attains significance even at the .1 level with risk controls. The results for being married and for working are similar using the two estimators.

For completeness, the third column of each panel in Table V presents bootstrapped estimates of the probability that the two estimates are the same.[12] Most of the estimates are statistically significantly different which is consistent with our expectation that both are biased.

There are two important points to take away from Table V. The first is that even the lower bound estimates in the second column are modest in size. These estimates suggest an effect of a few percent on family income, an eight percentage point drop in the probability of obtaining a high school diploma or GED and about a third year less in educational attainment. These effects are not trivial but they also confirm the view that much of the perceived effect of teenage motherhood on adult outcomes actually captures other factors.

The second point is that there is still a notable difference between the upper- and lower-bound estimate. The upper-bound estimates are consistent with the view of teen motherhood as a benign decision to time birth early. The lower-bound estimates are not. It is therefore important to move beyond the bounds presented in Table V.

6 Consistent Estimates

Figures 2 and 3 give the estimated distribution of latent miscarriages and latent abortions using the competing hazard model described in the methods section. As can be seen from the similarity of the two figures, it makes very little difference whether we assume that when an abortion and a miscarriage are "scheduled" for the same week we observe an abortion or whether we assume the opposite. In the latter case we estimate that 26.4% of teens are abortion types and 11.9% are miscarriage types (see Table VI). With the former assumption, the figures are 26.2% and 12.2%. Again, with the latter assumption, 46.8% of women who are both abortion types and miscarriage types have miscarriages while with the former, the estimate is 38.5%.

Given the similarity of the estimated densities, it is not surprising that the results presented in Table VII are similar regardless of the assumption we choose. The first two columns of Table VII replicate the IV and OLS results with risk controls. The third and fourth columns are the estimates under the assumption that in any week a scheduled miscarriage occurs before

[12] In each repetition we chose a sample equal in size to the sample for the IV estimates. We did not impose that the proportion of pregnancies ending in abortion, live birth and miscarriage equal the proportions in the sample. Therefore the sample size for the OLS estimates was random.

Figure 2: Timing of Latent Miscarriages and Abortions: Miscarriages First

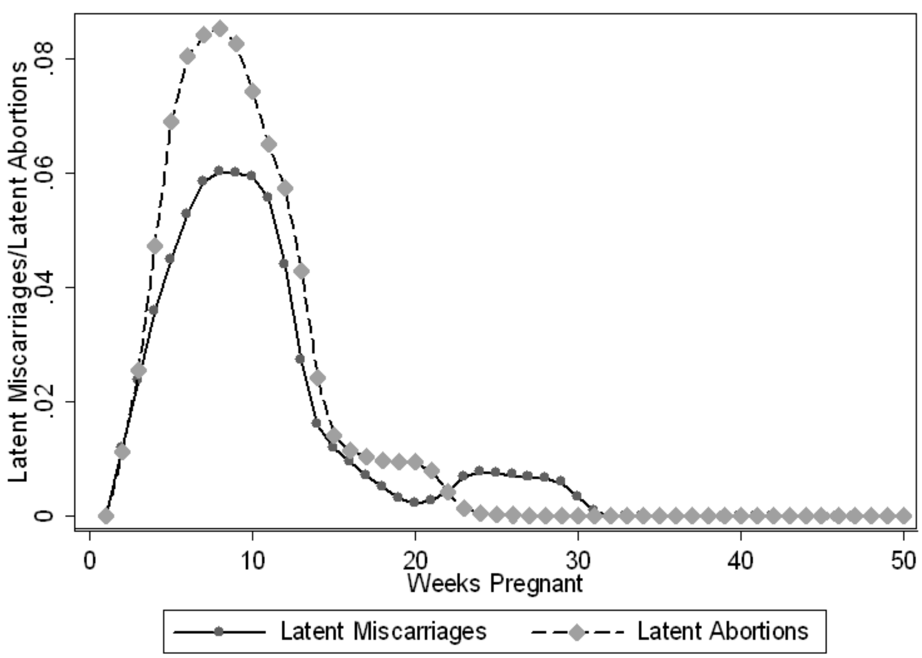
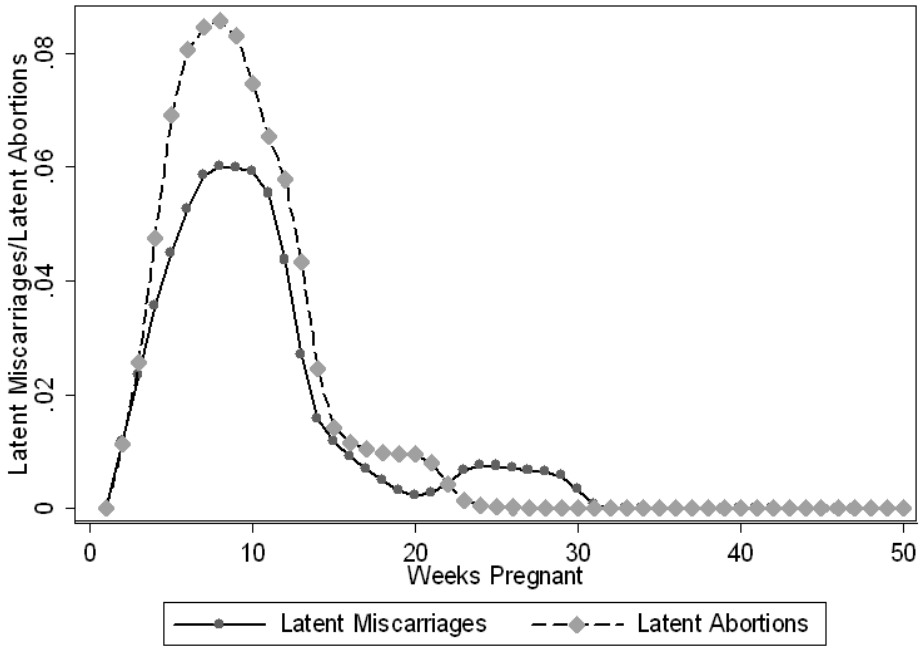


Figure 3: Timing of Latent Miscarriages and Abortions: Abortions First



a scheduled abortion.[13] The third column is in a sense the bias term. It is the expected difference in the outcome between women who have abortions and those who give birth *if they had not given birth*.

We can see that these differences are often large. Even in the absence of a birth, teens who would abort would be 33 percentage points more likely to graduate high school and would have close to two years more education. They would have substantially higher personal, spousal and family incomes and would have about one-half child less. They would also be somewhat less likely to be married. Differences in employment are small.

In contrast the estimated causal effects of giving birth are negligible. There is no difference in the probability of having a high school diploma and

[13]The standard errors in columns three through six are derived by bootstrapping treating the parameters estimated in the competing risks model as known. Since the results in columns three and four are similar to those in five and six despite the differences in the results of the competing risks models, allowing for this additional source of uncertainty is unlikely to noticeably affect the standard errors.

only about one-eighth year difference in average education although there is a five percentage point difference in the probability of having a GED. Personal incomes are trivially higher for those who give birth. Spousal incomes are actually somewhat higher conditional on having a partner and family income slightly higher despite the lower probability of marriage. Incomes relative to the poverty line are somewhat lower reflecting the larger number of children among those who give birth as teens. None of the estimated effects except for the increase in number of live births and the reduction in hours worked is statistically significant.

The last two columns show the results for the case where in any week, if scheduled, an abortion takes place before a miscarriage can occur. There are no important differences from the results based on the opposite assumption.

Overall Table VII suggests that except for an increase in the number of live births, teen births have little effect, positive or negative, on adult outcomes.

7 Multiple Teen Pregnancies

The approach so far allows us to estimate the effect of a birth from a first teen pregnancy on women who would choose to carry their first teen pregnancy to term. Thus the discussion so far ignores the possibility that teenagers whose first pregnancy does not end in birth may nevertheless give birth in their teens. In particular, if most teenagers who would choose to give birth but have a miscarriage later give birth as teens, miscarrying may have little impact on teens who would otherwise have given birth.

In fact, some teens who miscarry and some teens who have abortions on their first pregnancy subsequently give birth as teens. As shown in Table III, almost 30% of teens whose first teen pregnancy ends in miscarriage and 13% of those for whom it ends in abortion subsequently give birth as teens. Teens who miscarry have about one half the probability of giving birth as teens compared with those who do not miscarry on first teen pregnancy.

We extend the previous analysis in a straightforward manner. In this case, we again have two inconsistent estimators. For both estimators, not having a miscarriage on first teen pregnancy is an instrument for a teen birth. However, in one case, analogous to the IV estimator when we ignore births subsequent to miscarriage or abortion, the estimation is performed on the entire sample. We call this estimate β_{HMS} although it is, in fact, only analogous to the HMS estimator. In the second case, analogous to the OLS estimate, girls whose first teen pregnancy was terminated by an abortion are removed from the sample. We call this estimate β_{MB} to indicate that the sample is limited to those whose first teen pregnancy ended in miscarriage or birth.

We will use the following notation: b is the probability of being a true birth type whether presenting as a birth type or abortion type on first pregnancy. b_A is the probability of being a true birth type but presenting as an abortion type on first pregnancy. This does not necessarily mean that the teen has an abortion. Just as a true abortion may have a miscarriage, a "false abortion" type may miscarry before she would otherwise have had an abortion. We write $b - b_A = b_f$ as the probability of being a true birth type and presenting as such on first pregnancy. Again, such women do not necessarily give birth since they may miscarry. As before, m is the probability of miscarriage on first pregnancy and is independent of type. Similarly, γ is the probability of abortion if both a latent-miscarriage type and either a latent-true-abortion type or latent-false-abortion type on first pregnancy. Finally, we add b_1 the probability of having a subsequent pregnancy that ends in a teen birth for a true birth type who did not give birth on first pregnancy (whether or not presenting as a birth type or false abortion type on first pregnancy). Note that this probability is independent of whether the teen aborts or miscarries provided that she is a true birth type.

Y_A continues to be the expected outcome for a true abortion type in the absence of a birth. Y_0 is the expected outcome for a true birth type in the absence of a birth regardless of whether this is due to miscarriage or abortion, and Y_B is the expected outcome after birth regardless of whether the birth occurs on a first or subsequent pregnancy.

Put differently, we assume that there were some teens, randomly drawn from latent-birth types, who nevertheless had abortions. We think of these as teens who would choose to give birth but due to the particular circumstances surrounding their first pregnancy, they have an abortion. Subsequent to having an abortion, they are indistinguishable from latent-birth types who miscarry. If they do not have a subsequent birth, they have the same outcomes as birth-types who miscarry and do not have a subsequent birth. Similarly, their probability of having a subsequent birth is the same as for those who miscarry and the resulting outcome is the same. We recognize that these are strong assumptions, but we have not found a way to get a consistent estimator in their absence.

Finally, we have assumed that γ, the probability that an abortion/miscarriage type has an abortion is independent of whether the teen is a true or false abortion type. To test this assumption we compared the timing of abortions followed by teen births with those not followed by teen births. In our data, among those who ended their first pregnancy through an abortion, the difference in duration of that pregnancy, between those who subsequently gave birth as teens and those who did not, is less than one half week. A Kolmogorov-Smirnov test of the equality of the distributions falls well short of significance at conventional levels.

Under these assumption, then the probability that someone is a true-abortion type and has an abortion is $(1-b)((1-m)+m\gamma)$, and this is associated with outcome $Y_{A.}$ The probability that a woman is a false abortion (or birth after abortion type) and has an abortion on first pregnancy is $b_A(1-m+m\gamma)$. Such women have outcome Y_B with probability b_1 and Y_0 with probability $(1-b_1)$ Finally the probability that a woman is a birth-type who presents as such on first pregnancy and gives birth is $(b-b_A)(1-m)$ with associated outcome Y_B.This gives

$$E(Y|M = 0) = \frac{(1-b)(1-m+m\gamma)Y_A + b_A(1-m+m\gamma)(b_1Y_B + (1-b_1)Y_0) + (b-b_A)(1-m)Y_B}{1-m+m\gamma-bm\gamma+b_Am\gamma} \quad (14)$$

Similarly, the probability that a woman is a true abortion type and miscarries is $m(1-b)(1-\gamma)$ with associated outcome Y_A. The probability that she presents as a birth type on first pregnancy and miscarries is $m(b-b_A)$ while the probability that she is a true birth type but presents as an abortion type and miscarries is $mb_A(1-\gamma)$. All birth types who miscarry, regardless of how they present on first pregnancy have expected outcomes $(1-b_1)Y_0+b_1Y_B$. After some manipulation, this gives

$$E(Y|M=1) = \frac{(1-b)(1-\gamma)Y_A + (b-\gamma b_A)((1-b_1)Y_0 + b_1Y_B)}{(1-b)(1-\gamma)+b-\gamma b_A}$$

The difference in probability of any teen birth between those who do not miscarry on first pregnancy and those who do is

$$\begin{aligned} E(B|M &= 0) - E(B|M=1) \\ &= \frac{b_A(1-m+m\gamma)b_1 + (b-b_A)(1-m)}{1-m+m\gamma-bm\gamma+b_Am\gamma} - \frac{(b-\gamma b_A)b_1}{(1-b)(1-\gamma)+b-\gamma b_A} \quad (15) \end{aligned}$$

The Wald estimate of the HMS-style IV estimator is

$$\beta_{HMS} = \frac{E(Y|M=0) - E(Y|M=1)}{E(B|M=0) - E(B|M=1)} \tag{16}$$

which after substitution and simplification gives

$$\beta_{HMS} = Y_B - Y_0 + \frac{\gamma(1-b)(Y_A - Y_0)}{(1-m)(1-b_1) - \gamma(1-b+(1-b_1)(b_A(1-m) - m(1-b)))} \tag{17}$$

which is, as before, biased towards a benign view of teen motherhood.

For the restricted sample we have

$$E(Y|M=0) = Y_B \tag{18}$$

while $E(Y|M=1)$ is unchanged from above. The Wald estimator is given by

$$\beta_{MB} = \frac{E(Y|M=0) - E(Y|M=1)}{E(B|M=0) - E(B|M=1)} \tag{19}$$

where

$$E(B|M = 0) = 1 \tag{20}$$

$$E(B|M = 1) = \frac{(b - \gamma b_A)b_1}{b - \gamma b_A + (1-b)(1-\gamma)} \tag{21}$$

which, in turn, after substitution and simplification gives

$$\beta_{MB} = Y_B - Y_0 - \frac{(Y_A - Y_0)(1-b)(1-\gamma)}{1 - (1 - b + b_A(1-b_1))\gamma - b_1 b}. \tag{22}$$

We now have seven unknowns: the effect of giving birth as a teen ($Y_B - Y_0$), the difference in outcomes between abortion and birth types in the absence of a birth ($Y_A - Y_0$), the fraction of pregnant teens who are "true latent-birth types" (b), the fraction who are latent-miscarriage types (m), the fraction who are latent-false abortion (or latent birth-after-abortion) types (b_A), the fraction who are both abortion types and miscarriage types who have abortions (γ) and the fraction of true birth types (whether or not they are birth after abortion types) who do not give birth on first pregnancy and subsequently give birth as a teen (b_1).

The extension of our earlier procedure for calculating m, b and γ would be straightforward if there were no "false-abortion" types. In that case, we would calculate these parameters as before and then divide the fraction of teens who give birth following a miscarriage by the fraction of teens who are both miscarriage and birth types to get b_1.

The existence of false-abortion types only slightly complicates estimation. As noted above, we assume that the probability of being a miscarriage type and the probability of having an abortion given being both a miscarriage type and a (true or false) abortion type are independent of whether the teen is a true or false-abortion type. Under this assumption our earlier procedure gives us consistent estimates of m and γ. However, instead of an estimate of b, we get an estimate of the proportion of pregnant teens who are birth types and who do not present as abortion types. We call this birth types on first pregnancy

$$b_f = b - b_A. \tag{23}$$

The proportion of teens who have abortions followed by births (p_A) is

$$p_A = b_1 b_A (1 - m + m\gamma). \tag{24}$$

The proportion of all pregnant teens who miscarry and subsequently give birth (p_M) is

$$p_M = b_1 m (b_f + (1 - \gamma) b_A). \tag{25}$$

Together with the values of γ, b_f and m derived from the competing risks model and the data on the fraction of births following miscarriages and abortions, equations (23)-(25) allow us to estimate b, b_A and b_1. This, in turn, allows us to use (**??**) and (22) to get consistent estimates of $Y_B - Y_0$ and $Y_A - Y_0$.

8 Multiple Pregnancies: Results

Table VIII reports the results of this estimation for the case where we use risk controls and where we assume that in any week where both are scheduled to occur, an abortion is observed instead of a miscarriage. As would be expected the estimated direction of the effects is the same for each of the two estimation techniques although the magnitudes are somewhat larger.

Using the HMS instrumental variables approach we continue to estimate generally favorable effects of teen births although these estimates are generally not statistically distinguishable from zero. Women who give birth as teens are estimated to have a nine percentage point higher probability of having a high school diploma, about a thirteen percentage point lower probability of having a GED and to have about three-tenths of a year additional education on average. They have somewhat higher personal and family incomes. Their spouses' incomes are noticeably higher, an effect which is significant at the .1 level. There are small negative effects on employment. However, teenagers who give birth have total fertility that is one child greater than those who do not.

On the other hand, when the sample is limited to those whose first teen pregnancy ended in birth or miscarriage, we again generally observe adverse effects of giving birth and the magnitude of these effects is larger than when we ignore second pregnancies. We estimate that women who gave birth as teens are about eleven percentage points less likely to have a high school diploma or GED and have about one half year less education. They have lower personal and family incomes although somewhat higher spousal incomes conditional on being married. They are somewhat less likely to be working although these last few effects are not statistically significant.

The rest of Table VIII provides consistent estimates of β_1 (the bias term) and β_0, the effect of birth on adult outcomes. As in Table VII, the results are largely unaffected by whether we assume that in a given week a "scheduled" miscarriage preempts a "scheduled" abortion or vice versa. The magnitude of the estimated effects remains small although general negative.

Overall, the results are similar to those obtained when we focused on the outcome of the first pregnancy. There are adverse effects on education, but these are small (roughly one-quarter year and a nine percentage point drop in having a high school diploma or GED, mostly because of a decline in GED's) and similarly small effects on the probability of working and being married. The net result is essentially no effect on personal or family income although given the larger family size of those given birth and modest negative effect on family income relative to the poverty line.

9 Extensions:

9.1 Late Miscarriages

We have provided evidence that, conditional on smoking behavior during pregnancy and age at conception being greater or less than fifteen, late miscarriages are random, and, since abortions after the sixteenth week are relatively rare, not likely to include latent-abortion types. Therefore, in principle, we can get unbiased estimates of the effect of birth by using women with late miscarriages as the comparison group for those who gave birth as teens.

The first part of Table IX shows the results of restricting the sample to those whose first pregnancy lasted at least sixteen weeks and who did not have an abortion. The first column provides OLS estimates based on the outcome of the first pregnancy. The second column uses the first pregnancy outcome for this restricted sample as an instrument for whether the woman had any teen birth.

Unfortunately the results are considerably less precise than we would hope. None of the effects in the first column is statistically significantly different from the comparable estimate in table V. Moreover, consistent with those estimates, none of the effects of teen motherhood on adult outcomes is statistically distinguishable from zero except the effect on total live births. On the other, because the standard errors are large, we also cannot rule out large adverse effects of teen pregnancy.

The situation is similar with respect to the second column where we look at the effect of any teen birth on the outcomes. Again the results are statistically indistinguishable from those in the second column of Table VIII, but we are also unable to rule out large adverse effects of teen births.

We are more inclined to view the results as weak evidence in favor of the absence of a large bias and in favor of modest adverse effects of teen births. It is implausible that having a child as a teen causes an increase of more than one live birth over the woman's lifetime. Yet, the point estimate in the second column is well above one, and the upper end of the confidence interval is implausibly large. We conclude that the differences between the estimates based on only the long pregnancy sample and those based on the full sample are most likely due simply to the imprecision of the estimates using the former.

9.2 Changing Effects with Age

One of the messages of the HMS paper is that teen births are largely a matter of timing. Teens who give birth have only slightly more live births over their lifetimes. They suffer the disadvantages of having children when they are young but fare better than their counterparts when they are older because they no longer have children. Depending on the model of wage determination and the relation between the discount rate and the rate of growth of wages, either delaying childbirth or advancing it could be the optimal strategy for maximizing lifetime income (see Buckles, 2005). Of course, there are other reasons for choosing the timing of births, but based on the results in HMS, one could reasonably argue that for the women who give birth as teens, early child-bearing is an optimal strategy.

To address this issue, we interact the effect of a teen birth with the current age of the mother. To parallel HMS, we looked at the effect of a birth from the initial teen pregnancy. In general the interaction effects did not approach statistical significance and are therefore not shown. Either such age effects do not exist in our data or they are too small to be estimated with any precision.

There are two noteworthy exceptions. The first is total number of live births. When we use IV estimation, the interaction falls only somewhat short of statistical significance at conventional levels. The point estimates imply that women who give birth on their first teen pregnancy have about nine-tenths more children at age eighteen than those who do not, a plausible number but that by age forty-two this difference has fallen to three-tenths, a number consistent with the estimates in HMS. When we do OLS on the miscarriage/birth sample, the interaction term is significant at the .05 level, and the point estimates imply that at age eighteen those who give birth on first pregnancy have 1.1 more children at age 18 but only .4 more children by age 42.

The second exception is total family income relative to the poverty using the miscarriage/birth sample. In this case, the interaction is highly significant. The point estimates imply that there is a very large adverse on the family incomes of eighteen year olds (equal to the level of poverty income for the family using the HMS instrumental variables) but that this adverse effect disappears sometime during the woman's thirties and turns positive by age forty using even the OLS birth/miscarriage estimates. This is consistent with the teen mothers having somewhat smaller families by age forty.

With this one important exception, our results point towards modest but constant adverse impacts of giving birth as a teen. The fact that we are able to detect an effect that diminishes with age when we would most expect it, total number of live births, reinforces our confidence that we are not missing important age interactions.

9.3 Underreporting of Abortions

We noted in the discussion of the data that it is likely that a significant fraction of abortions are not reported in the data set. We might be concerned that this explains our inability to detect significant adverse impacts from teen births. In fact, underreporting probably leads us to overestimate the magnitude of any negative effects.

If nonreporting of abortions is random, then it is straightforward to show that as the proportion of abortions that are not reported goes up, the favorable bias of the IV estimator diminishes and may even be reversed. The intuition is as follows. The IV estimator is biased towards finding benign effects of births because the proportion of abortion-types is higher among the abortion/birth group than is the proportion of latent-abortion types among the miscarriage group. But if abortions are underreported this discrepancy is diminished and possibly reversed. In the extreme case where no abortions were reported, the restricted sample and the IV sample would be identical and both would be biased towards overestimating the adverse effect of teen births.

This argument is exacerbated if some women report abortions as miscarriages since this will simultaneously reduce the proportion of abortion-types in the birth/abortion group and increase the proportion in the miscarriage group, thereby reducing the favorable bias of the IV estimator and increasing the unfavorable bias of the OLS estimator.

It is, of course, possible that nonreporting is nonrandom in a way that creates a different bias. We know of no obvious way to address this concern.

9.4 Adoptions

One potential explanation for the small impact of teen births on mothers is that many teen mothers give their babies up for adoption. In fact, relatively few teen mothers in our sample do so (although the children may be brought up by grandparents). We experimented with making the explanatory variable "giving birth and keeping the child." The results were unaffected.

9.5 Timing of Births

It has been suggested to us that women who give birth may be more likely to have a second pregnancy because it is optimal to space births relatively close together. Of course, the physical limitations on second pregnancy and the contraceptive effect of breastfeeding work in the opposite direction. We examined the relation between the pregnancy outcome and the probability of a second conception before age twenty. Women who miscarried were most likely (68%) and those who had an abortion were least likely (51%) to have a second pregnancy before age twenty. Those who gave birth were significantly less likely (55%) than those who miscarried to have a second pregnancy by age twenty. The difference between those aborting and those giving birth is not statistically significant at conventional levels.

10 Conclusions

Our results reinforce recent research that finds at most modest adverse causal effects of teen births on the mothers. However, they do not support an even more benign view that teenage motherhood generates beneficial outcomes for the women who choose to become teen mothers. Instead, our results strongly suggest that this conclusion rests on the use of a positively biased estimator.

Our conclusions rest on a set of key assumptions. The first is that, in the absence of abortion, women who miscarry and women who do not miscarry would have similar outcomes in the absence of a birth. In other words, in the absence of abortion, miscarriage would be random, at least conditional on a small number of measured factors. We provide direct evidence to support this assumption and indirect evidence in the form of similar outcomes for teens having early and late abortions.

Our second key assumption is that the timing of abortions is random conditional on choosing an abortion. Again we provide some direct evidence that outcomes are similar for early and late abortions.

Our third key assumption, that we observe all abortions, is obviously false. Unreported abortions will tend to reduce the upward bias of the HMS estimator. Since our consistent estimator is implicitly a weighted average of the HMS and restricted-OLS estimators, we expect that nonreporting biases us towards finding more adverse effects of births.

Given this evidence, we conclude that the adverse effects of birth on the mothers who would choose to give birth are modest. This, of course, does not preclude the existence of potentially large adverse effects on those who choose abortion or who avoid pregnancy altogether.

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Table I
Descriptive Statistics

	Full Sample	Teen Pregnancy
Teen Pregnancy	0.18 (0.38)	1.00 (0.00)
Teen Birth	0.12 (0.32)	0.65 (0.47)
High School Diploma	0.82 (0.38)	0.50 (0.50)
GED	0.06 (0.24)	0.19 (0.39)
Education	13.3 (2.73)	11.3 (2.58)
Currently Married	0.57 (0.50)	0.53 (0.50)
Currently Divorced or Separated	0.14 (0.35)	0.24 (0.43)
Currently Working	0.73 (0.45	0.63 (0.48)
Current Hours	27.6 (19.7)	24.0 (20.7)
Current Income if Working	21,986 (16,985)	18,107 (12,152)
Current Spouse Income if with Partner	36,243 (24,466)	29,585 (20,112)
Current Family Income	43,595 (30,779)	33,692 (26,212)
Percent Poverty Level Income	339 (225)	250 (195)
Number of Children	1.45 (1.35)	2.31 (1.41)
Age at Interview	32.4 (7.00)	32.3 (6.92)
White	0.71 (0.45)	0.59 (0.49)
Hispanic	0.11 (0.31)	0.14 (0.34)
Black	0.13 (0.34)	0.24 (0.43)
Protestant	0.54 (0.50)	0.59 (0.49)
Roman Catholic	0.35 (0.48)	0.30 (0.46)
No Mother	0.006 (0.08)	0.01 (0.12)
No Father	0.05 (0.21)	0.10 (0.29)
Mother's Education	11.4 (3.55)	10.4 (3.7)
Father's Education	11.7 (4.02)	10.3 (4.2)
Working Mother	0.43 (0.50)	0.50 (0.50)
Age at First Birth	22.6 (4.9)	18.0 (2.95)
Observations	9,431	1,913

Notes: Sample means and standard deviation using sample weights. The *Full Sample* corresponds to all of the women surveyed in the *National Survey of Family Growth* while the *Teen Pregnancy Sample* represents women having a pregnancy before their 18th birthday. In both samples only women at least 20 years old when surveyed in 1995 were included.

Table II
Teen Pregnancy Outcomes

Conception at Age 11	0.003 (0.06)
Conception at Age 12	0.01 (0.09)
Conception at Age 13	0.04 (0.20)
Conception at Age 14	0.09 (0.29)
Conception at Age 15	0.18 (0.38)
Conception at Age 16	0.31 (0.46)
Conception at Age 17	0.38 (0.49)
Have smoked 100 cigarettes in lifetime?	0.62 (0.49)
Do you smoke now?	0.46 (0.50)
Started smoking before pregnancy?	0.27 (0.44)
Married at conception?	0.12 (0.33)
Birth	0.65 (0.48)
Abortion	0.25 (0.43)
Miscarriage	0.10 (0.30)
Had another pregnancy?	0.89 (0.32)
Age at next pregnancy	20.3 (3.47)
Observations	1,913

Notes: Sample means and standard deviation using sample weights. The sample corresponds to the *Teen Pregnancy Sample*. Miscarriage includes stillbirths and ectopic pregnancies.

Table III
Descriptive Statistics by Pregnancy Outcome

	Birth	Miscarriage	Abortion	Early Abortion	Late Abortion
High School Diploma	0.41 (0.49)	0.45 (0.5)	0.73 (0.45)	0.75 (0.44)	0.65* (0.48)
GED	0.21 (0.41)	0.25 (0.43)	0.12 (0.32)	0.10 (0.30)	0.17* (0.38)
Education	10.8 (2.53)	11.1 (2.51)	12.6 (2.28)	12.5 (2.28)	12.7 (2.29)
Currently Married	0.53 (0.50)	0.55 (0.50)	0.51 (0.50)	0.50 (0.50)	0.54 (0.50)
Divorced or Separated	0.25 (0.43)	0.22 (0.42)	0.22 (0.42)	0.24 (0.43)	0.15** (0.36)
Currently Working	0.60 (0.49)	0.65 (0.48)	0.69 (0.47)	0.69 (0.46)	0.66 (0.48)
Current hours	22.8 (20.6)	26.4 (21.8)	26.1 (20.2)	26.1 (20.0)	26.0 (21.0)
Annual Income if Working	16,881 (11,128)	17,370 (13,418)	21,212 (13,313)	21,317 (13,535)	20,814 (12,532)
Spouse Annual income if with Partner	27,344 (18,140)	26,353 (15,574)	36,612 (24,510)	37,119 (25,114)	34,758 (22,302)
Family Annual Income	30,928 (24,710)	31,749 (24,435)	41,692 (29,005)	42,528 (29,211)	38,726 (28,219)
Poverty	221 (177)	242 (186)	329 (219)	335 (217)	307 (227)
Number of Children	2.71 (1.31)	1.85 (1.40	1.44 (1.22)	1.41 (1.21	1.58 (1.27)
Age at first birth	16.7 (1.17)	19.7 (3.08)	21.6 (3.86)	21.6 (3.8)	21.8 (4.17)
Age at next pregnancy	20.4 (3.36)	18.9 (2.76)	20.5 (3.90)	20.5 (3.8)	20.7 (4.27)
Teen birth	1.00 (0.00)	0.29 (0.46)	0.13 (0.33)	0.13 (0.33)	0.13 (0.34)
White	0.521 (0.50)	0.68 (0.47)	0.74 (0.44)	0.76 (0.43)	0.69 (0.46)
Hispanic	0.17 (0.38)	0.11 (0.31)	0.06 (0.24)	0.06 (0.25)	0.06 (0.24)
Black	0.28 (0.45)	0.19 (0.39)	0.17 (0.38)	0.15 (0.36)	0.24* (0.43)
Protestant	0.64 (0.48)	0.58 (0.49)	0.48 (0.50)	0.47 (0.50)	0.51 (0.50)
Roman Catholic	0.28 (0.45)	0.31 (0.47)	0.36 (0.48)	0.39 (0.49)	0.23*** (0.42)
No Mother	0.007 (0.08)	0.05 (0.22)	0.006 (0.08)	0.01 (0.09)	0.00 (0.00)
No Father	0.11 (0.31)	0.10 (0.31)	0.07 (0.25)	0.06 (0.24)	0.08 (0.28)
Mother's Education	9.69 (3.82)	10.7 (3.42)	12.0 (2.65)	12.0 (2.72)	11.96 (2.42)
Father's Education	9.51 (4.31)	11.0 (3.90)	12.0 (3.35)	12.1 (3.31)	11.6 (3.50)
Working Mother	0.49 (0.50)	0.54 (0.50)	0.53 (0.50)	0.49 (0.50)	0.68*** (0.47)
Observations	1,313	186	414	311	103

Notes: Sample means and standard deviations for *Teen Pregnancy Sample.* All statistics employ sample weights. Miscarriage includes stillbirths and ectopic pregnancies. Asterisks represent a test of whether outcomes for early and late abortions are the same at 10%(*), 5%(**) or 1%(***).

Table IV
Probit Estimates of the Relation between Individual Characteristics and Miscarriage

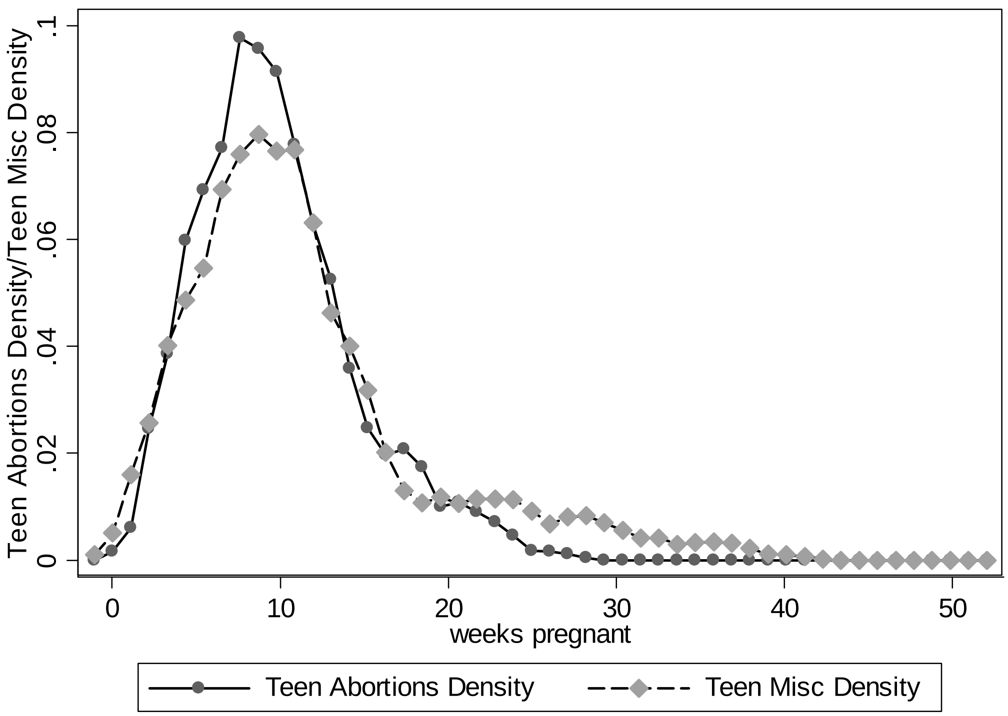
	Full Sample (FS)	FS - No Abortions (NA)	FS-NA Weeks Pregnant > 24	FS-NA Weeks Pregnant > 16	Teens-NA Weeks Pregnant > 16
White	-0.03 (0.10)	0.004 (0.10)	-0.19 (0.26)	0.09 (0.22)	-0.15 (0.39)
Hispanic	-0.13 (0.11)	-0.09 (0.12)	-0.25 (0.30)	-0.03 (0.24)	-0.41 (0.47)
Black	-0.14 (0.11)	-0.11 (0.11)	0.08 (0.27)	0.29 (0.23)	-0.05 (0.40)
Protestant	0.07 (0.07)	-0.04 (0.07)	0.26 (0.23)	0.20 (0.15)	0.06 (0.29)
Roman Catholic	0.08 (0.07)	0.004 (0.07)	0.11 (0.24)	0.10 (0.16)	0.18 (0.32)
No Mother	0.75 (0.19)	0.81 (0.20)	0.35 (0.49)	-0.11 (0.46)	0.76 (0.60)
No Father	0.15 (0.10)	0.24 (0.11)	-0.06 (0.27)	0.21 (0.18)	0.06 (0.36)
Mother's Education	0.005 (0.007)	0.02 (0.01)	-0.005 (0.02)	-0.003 (0.01)	0.01 (0.03)
Father's Education	0.01 (0.006)	0.02 (0.01)	-0.004 (0.02)	0.004 (0.01)	0.02 (0.02)
Working Mother	0.05 (0.04)	0.08 (0.04)	-0.11 (0.11)	-0.08 (0.08)	0.02 (0.15)
Smoking	0.15 (0.04)	0.17 (0.04)	0.04 (0.11)	0.18 (0.08)	0.19 (0.17)
Conception before 15	0.11 (0.10)	0.25 (0.11)	-0.18 (0.33)	0.40 (0.16)	0.42 (0.19)
IUD before first pregnancy	0.24 (0.17)	0.22 (0.17)	0.50 (0.34)	0.49 (0.26)	-
LR chi2	58.24	95.24	13.03	28.54	13.27
Observations	7,660	6,416	5,515	5,620	1,346

Table V
Effect of Teen Motherhood: Teens Experiencing Pregnancy

	No controls			Risk controls		
Outcomes	**BA/M**	**B/M**	**Std Err Bootstrap**	**BA/M**	**B/M**	**Std Err Bootstrap**
High School Diploma	0.07 (0.05)	-0.04 (0.04)	0.02	0.06 (0.05)	-0.05 (0.04)	0.02
GED	-0.09 (0.04)	-0.04 (0.03)	0.02	-0.08 (0.04)	-0.03 (0.03)	0.02
Education	0.22 (0.27)	-0.33 (0.19)	0.10	0.19 (0.27)	-0.37 (0.19)	0.10
Married	-0.03 (0.05)	-0.02 (0.04)	0.02	-0.04 (0.05)	-0.03 (0.04)	0.02
Divorced or Separated	0.03 (0.05)	0.03 (0.03	0.02	0.04 (0.05)	0.04 (0.03)	0.02
Working	-0.04 (0.05)	-0.05 (0.04)	0.02	-0.04 (0.05)	-0.05 (0.04)	0.02
Hours worked	-3.80 (2.16)	-3.67 (1.57)	0.85	-4.02 (2.17)	-3.84 (1.57)	0.87
Income if Working	1,188 (1,694)	-489 (1,112)	713	961 (1,697)	-658 (1,112)	712
Spouse Income	5,077 (2,907)	991 (1,793)	1,056	5,045 (2,911)	889 (1,793)	1,070
Total family income	2,997 (2,868)	-821 (1,928)	1,069	2,782 (2,868)	-1,096 (1,921)	1,079
Percent Poverty Level Income	12.50 (20.50)	-20.82 (13.43)	7.83	11.25 (20.55)	-22.67 (13.39)	8.00
Number of live births	0.70 (0.14)	0.86 (0.10)	0.05	0.69 (0.14)	0.85 (0.10)	0.05

Note: Controls: Smoker, age at conception before 15. Income is conditional on working and spouse income is conditional on being married or having a male partner. The third column of each panel shows the bootstrapped standard errors of the differences between the two coefficients.

Test for equality of distribution functions. Abortions vs miscarriages.



Two-sample Kolmogorov-Smirnov test for equality of distribution functions:

Smaller group	D	P-value	Corrected
0:	0.0199	0.903	
1:	-0.1060	0.056	
Combined K-S:	0.1060	0.112	0.092

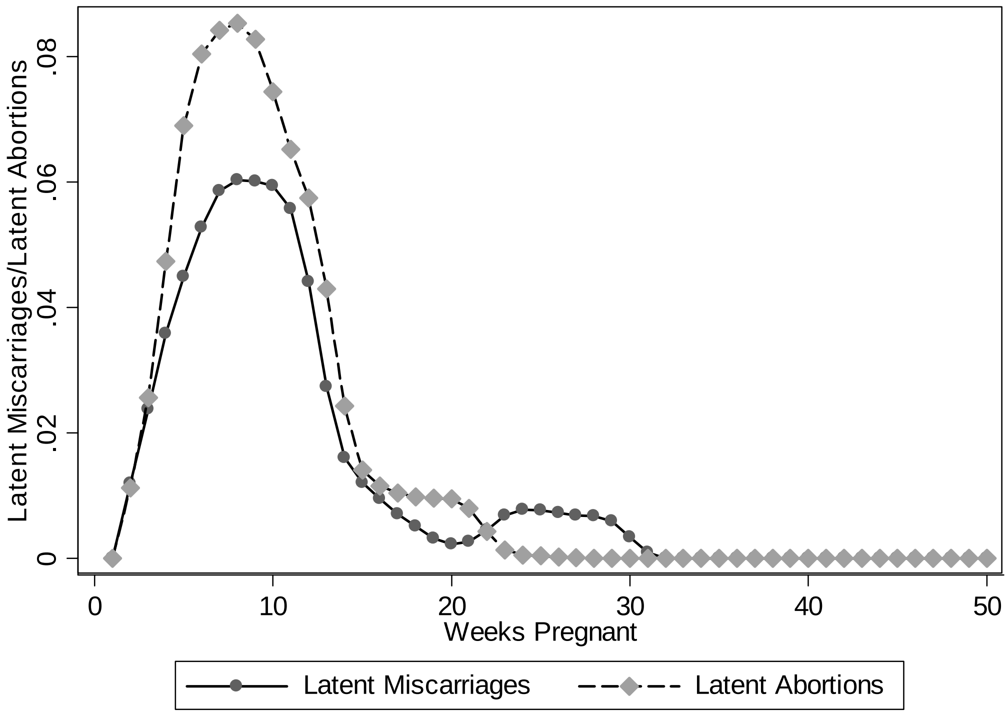
Table VI
Estimates from Competing Risks Model

	Misc First	Abort First
1-b*=Pr(A*=1)	0.26	0.26
m*= Pr(M*=1)	0.12	0.12
b*=Pr(B*=1)	0.74	0.74
1-γ	0.47	0.38
m= Pr(M=1)	0.10	0.10
Pr(A=1)	0.25	0.25
Pr(B=1)	0.65	0.65

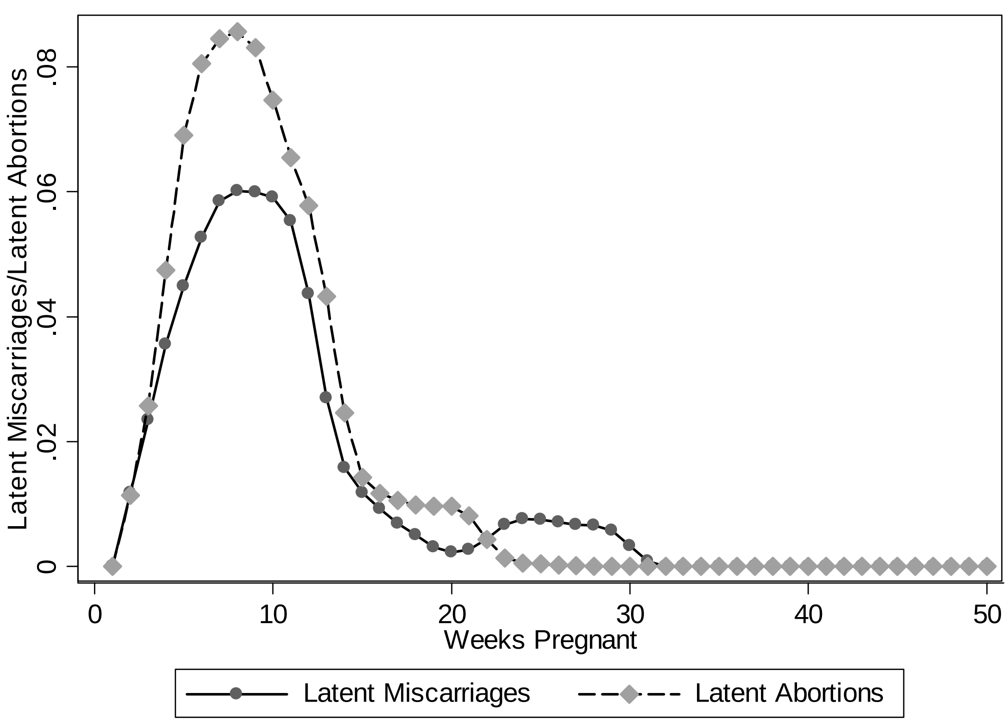
Weights are used

Latent Abortions and Miscarriages

Panel (a) (Miscarriage first)



Panel (b) (Abortion first)



Note: Weights are used for the estimations

Table VII
Effect of Teen Motherhood

	From Data		Solving Equations Miscarriage First		Solving Equations Abortion First	
Outcomes	**B/A vs M**	**B v M**	β_1	β_0	β_1	β_0
High School Diploma	0.06 (0.05)	-0.05 (0.04)	0.33 (0.06)	-0.003 (0.05)	0.32 (0.06)	-0.01 (0.05)
GED	-0.08 (0.04)	-0.03 (0.03)	-0.16 (0.05)	-0.05 (0.04)	-0.15 (0.05)	-0.05 (0.04)
Education	0.19 (0.27)	-0.37 (0.19)	1.69 (0.30)	-0.13 (0.25)	1.65 (0.29)	-0.17 (0.24)
Married	-0.04 (0.05)	-0.03 (0.04)	-0.04 (0.06)	-0.03 (0.05)	-0.04 (0.06)	-0.03 (0.05)
Divorced or Separated	0.04 (0.05)	0.04 (0.03)	-0.003 (0.05)	0.04 (0.04)	-0.003 (0.05)	0.04 (0.04)
Working	-0.04 (0.05)	-0.05 (0.04)	0.04 (0.06)	-0.05 (0.05)	0.04 (0.06)	-0.05 (0.05)
Hours Worked	-4.02 (2.17)	-3.84 (1.57)	-0.52 (2.61)	-3.92 (2.24)	-0.51 (2.54)	-3.90 (2.18)
Income if Working	961 (1,697)	-658 (1,112)	4,910 (2,149)	48.3 (1,667)	4,778 (2,091)	-84.0 (1,619)
Spouse Earnings if with Partner	5,045 (2,911)	889 (1,793)	12,604 (3,291)	2,702 (2,065)	12,264 (3,172)	2,363 (2,001)
Total Family Income	2,782 (2,868)	-1,096 (1,921)	11,759 (3,293)	597 (2,604)	11,443 (3,205)	278 (2,534)
Percent Poverty Level Income	11.25 (20.55)	-22.67 (13.39)	103 (24.4)	-7.87 (19.3)	100 (23.7)	-10.6 (18.8)
Number of Live Births	0.69 (0.14)	0.85 (0.10)	-0.50 (0.16)	0.78 (0.14)	-0.48 (0.15)	0.79 (0.13)

Weights were used to calculate βs. Controls: Smoker, age at conception before 15. Income is conditional on working and spouse income is conditional on being married or having a male partner. For the βs, bootstrapped standard errors are shown in parenthesis (taken the parameters in table VI as given)

Table VIII
Effect of Teen Motherhood. Multiple Pregnancies.

	From Data		Solving equations Miscarriage first		Solving equations Abortion first	
Outcomes	**B/A vs M**	**B v M**	β_1	β_0	β_1	β_0
High School Diploma	0.09 (0.08)	-0.07 (0.05)	0.55 (0.13)	-0.004 (0.07)	0.53 (0.13)	-0.02 (0.07)
GED	-0.13 (0.07)	-0.04 (0.04)	-0.29 (0.11)	-0.08 (0.07)	-0.28 (0.11)	-0.07 (0.06)
Education	0.29 (0.42)	-0.52 (0.27)	2.78 (0.65)	-0.19 (0.36)	2.72 (0.63)	-0.25 (0.35)
Married	-0.06 (0.08)	-0.04 (0.05)	-0.09 (0.12)	-0.05 (0.07)	-0.08 (0.12)	-0.05 (0.07)
Divorced or Separated	0.05 (0.07)	0.05 (0.05)	0.01 (0.10)	0.05 (0.06)	0.01 (0.10)	0.05 (0.06)
Working	-0.06 (0.08)	-0.07 (0.05)	0.05 (0.12)	-0.07 (0.07)	0.05 (0.12)	-0.07 (0.07)
Hours Worked	-6.20 (3.35)	-5.40 (2.21)	-2.74 (5.44)	-5.73 (3.30)	-2.68 (5.35)	-5.67 (3.22)
Income	1,534 (2,723)	-926 (1,564)	8,450 (4,930)	92.6 (2,483)	8,254 (4,749)	-104 (2,376)
Spouse Earnings if with Partner	8,627 (5,121)	1,315 (2,652)	25,116 (7,907)	4,342 (3,217)	24,533 (7,730)	3,757 (3,084)
Total Family Income	4,286 (4,447)	-1,543 (2,706)	20,021 (6,410)	870 (3,760)	19,556 (6,266)	404 (3,643)
Percent Poverty Level Income	17.37 (31.86)	-31.87 (18.84)	169 (48.6)	-11.5 (28.0)	165 (47.6)	-15.4 (27.1)
Number of Live Births	1.05 (0.21)	1.19 (0.19)	-0.46 (0.30)	1.14 (0.19)	-0.45 (0.29)	1.15 (0.18)

Weights were used to calculate βs. Controls: Smoking and age at conception before 15. Income is conditional on working and spouse income is conditional on being married or having a male partner. For the βs, bootstrapped standard errors are shown in parenthesis (taken the parameters in table VI as given).

Table IX
Birth vs Miscarriage: First Pregnancy Lasted More than 16 Weeks

Outcomes	1st Pregnancy	Multiple Pregnancies
High School Diploma	-0.05 (0.08)	-0.07 (0.11)
GED	0.02 (0.07)	0.03 (0.09)
Education	-0.27 (0.43)	-0.36 (0.58)
Married	-0.04 (0.09)	-0.06 (0.12)
Divorced or Separated	0.10 (0.07)	0.14 (0.10)
Working	-0.10 (0.08)	-0.14 (0.11)
Hours Worked	-6.28 (3.57)	-8.46 (4.81)
Income if Working	-1,973 (2,388)	-2,357 (2,852)
Spouse Income if with Partner	-6,414 (4,426)	-10,302 (7,104)
Total Family Income	-5,112 (4,379)	-7,019 (6,011)
Percent Poverty Level Income	-33.3 (30.4)	-44.9 (40.9)
Number of Live Births	0.93 (0.23)	1.25 (0.30)

Weights were used to calculate βs. Controls: Smoking and age at conception before 15. Income is conditional on working and spouse income is conditional on being married or having a male partner